

**Analysis of the Role of Waste Pickers on Informal Solid Waste  
Management: A Case of Roysambu Constituency, Nairobi County**

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## **DECLARATION**

I declare that this thesis is my original work and has not been presented for examination in any other university.

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This thesis has been submitted for examination with our approval as university supervisors

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## **LIST OF ABBREVIATIONS**

<b>SDG</b>	–	Sustainable Development Goals
<b>CBD</b>	–	Central Business District
<b>NGOs</b>	–	Non-Governmental Organizations
<b>CBO</b>	–	Community-Based Organizations
<b>SLA</b>	–	Sustainable Livelihoods Approach
<b>CED</b>	–	Commission on Environment and Development
<b>SWM</b>	–	Solid Waste Management

## ABSTRACT

With the increased population growth and urbanization, developing countries are faced with increased consumption and production activities. As a result, solid waste production has become a key concern in many countries, Kenya inclusive, due to the challenges of regulating it. In Kenya, solid waste management authorities have not in totality managed to control and collect the solid waste generated from the production and consumption activities. Informal waste picking has been rationalized on the grounds that; waste pickers make use of this opportunity to earn their living as the status quo of the urban areas cannot absorb them in the formal jobs sector. Through the literature search, it is clear that waste pickers help in creating wealth particularly for the cartels and brokers who engage in purchasing the collected waste. However, the informal solid waste management is not recognized and there is no regulation to guide this sector. Therefore this leaves big gaps for research to identify the role that informal waste pickers take in implementing a sustainable environment. This study is aimed at analyzing the role of waste pickers in the informal solid waste management sector taking Roysambu Constituency in Nairobi County, as the case study. The study made use of both qualitative and quantitative research approach through the use of survey design to collect data from 196 waste pickers ( $n = 196$ ) and assessed the degree to which they impact the informal waste management. The quantitative data was analyzed by the use of tables, graphs and percentages whereas the thematic analysis was used for the qualitative data. The study found that plastic containers are the most collected types at 35% however, there are other types of wastes that included glass 18%, scrap metal 12%. Additionally, informal waste pickers have an economic, as well as, environmental value.

The waste they collect has some economic value in terms of generating incomes for them and boosting the recycling activities where solid waste is converted to useful products. For instance plastic containers are recycled to make buckets, basins, water tanks, poles just to name a few. The environmental value that could be attached to waste pickers' role is that they contribute to a clean physical environment and some solid waste that would have otherwise ended in rivers and oceans is collected by waste pickers. Therefore the waste pickers' role in waste collection is a milestone to the actualization of the Constitution of Kenya, 2010 that envisages a clean and healthy environment to all. The waste pickers go through harsh social and economic challenges in their daily routines. They lack proper meals, they carry waste on their back, they are vulnerable to diseases and injuries and their income varies and they can survive on less than a dollar day which cannot support their siblings for the ones that have dependents. All the research objectives were achieved and all the research questions were answered. The study concludes that waste pickers are crucial players in solid waste management particularly for plastic containers which is the most common kind of waste of interest among the informal waste pickers because of the availability and attached economic value. The waste pickers are crucial actors in solid waste management and towards achieving a clean and healthy environment. Socially and economically, the informal waste pickers are neglected and sidelined. The study recommends for some changes within their structure which include implementing training programs, reduce the middle men, start more recycling plants where waste pickers can take solid waste directly, initiate a government compensatory programs which can include these people in the county-level waste management platforms. It is not enough to have solid waste collected and disposed in designated areas, it should be processed and converted to useful by-products this way it becomes less toxic.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background

In both the developing and developed countries, issues such as consumerism, production, urbanization and population growth have all interplayed thus affecting the rates of solid waste production, to which in many countries have stirred environmental havoc. Poor solid waste management has created several serious constraints particularly to the improvement of public health, environmental conditions and economic activities. Equally, such constraints are exacerbated due to the absence of efficient environmental controls, inadequate waste management handling and treatment facilities, as well as, poor waste treatment policies (Rocio *et al.* 2003). According to a study by Wilson *et al.* (2006) many of these third world countries do not, in totality, collect the solid waste generated through their local production activities despite allocating a significant amount of their budget on waste management (Adeyemi and Olorunfemi, 2001).

Additionally, in many developing countries, solid waste management has been left in the hands of the city council and County government and is supported by public funds collected through state or county level taxation (Wilson *et al.* 2006). Such an aspect indicates that the private producers have in a big attempt ignored implementing efficient and proper waste handling and disposal with an assumption that the duties and taxes imposed by the local governments on waste management caters for that (Thomas, 2008). With such ineffective policies by the County governments regarding the solid waste disposal responsibility, the informal sector and non-governmental agencies have volunteered to engage in efforts towards solid waste management. However, such efforts tend to be parallel with the existing control policies by the solid waste collection authorities, though in most cases it is guided by market forces (Thomas, 2008).

One notable aspect of the different informal strategies used by the informal sector entails the waste collection, segregation and recycling by informal waste collectors many of whom are marginalized individuals and immigrants in the metropolitan areas (Wilson *et al*, 2006). These informal waste pickers are also known as rag pickers, scavengers, or waste collectors depending on the country and the type of waste they collect. Wilson *et al*, (2006) defined informal waste collectors as the individuals who normally treat waste as an ore. A primary source where a variety of valuable products and materials can be mined from (Iskandar, 2003). Other studies by Iskandar(2003) defined informal waste pickers as individuals who literally live on waste translating to the idea that they are fully dependent on it, in terms of food and clothing. In majority of the countries with identifiable number of informal waste pickers, most of them are known to live along the landfills, waiting for “fresh” waste to arrive from the urban residential areas (Nguyen, 2000). Their key duties entail sorting such waste with the use of sticks, bare hands, magnets or simple hooks.

Recycling has several societal and environmental effects including reduced pollution, both for air and water pollution, reduction of energy consumed in industrial processes and saving costs associated with importation of raw materials (Medina,2000). However, in many of the developing countries, such an informal sector is not recognized. In fact, many informal waste collectors are perceived as street people susceptible to violent behaviors based on their use of drugs such as “glue” to cope with the landfill environment. Medina(2000) added that informal waste pickers are sometimes perceived to have mental illnesses, illiterate and having antisocial behaviors such as theft (Nguyen, 2000). Nevertheless, people tend to overlook the benefits associated with the type of work they do.

## **1.2 Statement of Research Problem**

Solid waste management in Kenya is constantly proving a hard nut to crack more so in Nairobi county. Some Governors across the country have acknowledged that solid waste management is one of the biggest challenges in their counties. During the 2017 elections, Nairobi city garbage menace dominated the Nairobi Gubernatorial debate. Contestants laid out their plans as to how they would manage this menace. This clearly shows that solid waste management is problematic to our nation and citizens as well as investors are concerned over the lack of its management. According to a report by Chepkoech (2016) published on Daily Nation, dated July 21 2016, Nairobi generates about 2400 tonnes of solid waste in a day and with Nairobi's population projected to increase to more than five million; this means that there will be a considerable increase in the variety and quantity of waste generated (Kazungu, 2010).

At the heart of building an investor attractive county there is need to demonstrate a clean and pleasant environment which allows business to run smoothly (Kazungu, 2010). However, the garbage waste menace cuts across all the Nairobi constituencies with major parts of Roysambu being affected significantly. For instance, garbage in major parts of Zimmerman, Githurai, Kahawa, and Kahawa West neighborhoods piles an eyesore scenery that has not only been a ticking bomb to the health of the residents, but it has been a stumbling block to many investments within the region. Many of the indiscriminate dumpsites within these regions present a messy environment that during the rainy season things are worse to an extreme of some businesses being adversely affected. The vendors may go without opening businesses since their premises are inaccessible due to bad odor coming from the blocked drainages and the rotten waste around them.

Recognition of the informal sector involved in solid waste management is a potential breakthrough to implementing a sustainable environment within the cities. However, there is inadequate documentation of environmental, social and economic issues revolving around informal waste picking. Given the fact that informal waste pickers have flocked dumpsites, tentatively with no abilities to own recycling units, its perhaps that there are “hidden” unions or cartels who carry out the recycling business and perhaps compensate the waste pickers with little token (money). However, there is scanty documentation on the role of waste pickers (also known as chokoras) in solid waste management.

### **1.3 Research Objectives**

#### **1.3.1 General Objective**

The overall objective of this study was to assess the contribution of waste pickers on informal solid waste segregation and recycling in Nairobi, Roysambu Constituency.

#### **1.3.2 Specific Objectives**

- i. To interrogate the sources and components of solid waste collected by the waste pickers.
- ii. To assess the legal frameworks governing the informal solid waste picking.
- iii. To assess the social, policy and economic issues encountered by waste pickers from the collection to the recycling of solid waste.

### **1.4 Research questions**

- i. What are the sources and components of solid waste collected by the informal waste pickers?
- ii. What are the social and economic issues affecting the informal waste pickers?



- iii. What are the legal frameworks governing the informal solid waste picking?

### **1.5 Hypothesis**

H<sub>0</sub>: The waste pickers have no significant contribution/role in the segregation and management of solid waste in streets and residential areas of Roysambu Constituency.

### **1.6 Justification**

This study offers an opportunity for the public to understand the environmental, economic and social impact that the informal waste management sector has in the country, particularly in managing the solid wastes within the county which appears uncontrollable by the County authorities. Despite the growth and development of education system in most countries, including Kenya, Solid waste management remains a challenge. Therefore, this research served as an eye opener for the public and policy makers to recognize the work that waste pickers do and change their negative attitude towards informal waste pickers. In addition, waste collection creates an opportunity for green jobs and sustainable local development. The County authorities should evaluate the current impact that the informal waste pickers have in solid waste management and possibly assess the regulatory policies and regulation to support this informal sector. In so doing, the authorities will get to understand the health and social effects that revolve around these informal waste pickers, as well as, the hierarchies that exist in this sector in an attempt of implementing supportive measures and initiatives for this population.

Nevertheless, the national government would be in a position to understand the impact that informal waste collectors have in supporting sustainable environment and perhaps initiate financial aid program and regulatory initiatives to support this sector. Furthermore, with the knowledge of the current situation in Roysambu may be a cornerstone of understanding the salient environmental and health risks to the residents.

Together with the national government, the county government would initiate several environmental policies that will help to fight the menace, not only in Roysambu, but across the country.

Lastly, the findings were perceived to challenge the existing social and development goals on solid waste management because, currently, there are no documented policies governing informal solid waste management. This narrates that policy makers stand a chance to see the sense of integrating the informal solid waste management as part of the SDGs spelt under Vision 2030. Consequently, this not only supports lives of young people that are jobless, it also enhances environmental sustainability since most waste would be collected. Collected solid waste is somewhat profitable business for the poor and could be a source of wealth creation in the future (Wachukwu *et al.* 2010).

Even with little or no formal education informal waste pickers know a great deal about segregation, reuse and recycling. With the recent ban on plastics having commenced, informal waste pickers stand a chance to play an extensive role in clearing what is left of the plastics on the streets and dumpsites. Perhaps, understanding waste pickers role would propel government efforts to address the different challenges that these informal waste pickers undergo. The County government and other stakeholders in the industry could promulgate the expertise of informal waste collectors to achieve sustainable cities and communities (SDG 11) and decent work and economic growth (SDG 8). The study is relevant to the Constitution of Kenya 2010 that promises to provide a clean and healthy environment. The waste pickers are helping the country achieve this key promise to all citizens.

## **1.7 Scope and Limitations**

The main focus of the research was to identify various roles of informal waste pickers on informal solid waste management within Nairobi County. The study only considered the informal waste pickers that collect solid wastes along the streets and residential areas, but not within the dumpsites. Besides, the study focused on municipal solid waste and not any other form of waste. The coverage of this study was on the localities within Roysambu Constituency and its environs including Roysambu, Kahawa West, Kahawa, Githurai 44 and Zimmerman. Data collection was conducted between the months of September to October 2018. Given the vast number of informal waste pickers around these targeted localities, the time frame allocated for the study did not allow visiting all the informal waste pickers, hence it focused only on a sample size of 196 to conclude.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter reflects on the existing research studies related to informal waste collection and management in the developing countries. Ideally, it organizes the information based on the research objectives. The main areas featured include the overview of the solid waste management especially the informal sector, socio-economic issues surrounding the sector and its structural organization. Also, the chapter sheds light on the theoretical and the conceptual frameworks which can be used to study this informal solid waste collection phenomenon, as well as, the research gap.

#### **2.1.1 Solid Waste Management in Urban Areas**

Solid waste management in urban areas is a challenge driven by the high population growth rate which surpasses the available resources to handle the waste collected. However, this is only realized in urban areas within the developing countries such as India, Sub-Saharan countries and countries that have poor infrastructure, as well as, insufficient national budgets allocated towards solid waste management. However, this is different when it comes to the developed countries such as the US, Japan, Australia, Germany, Switzerland, Canada, and New Zealand to mention a few (Otterpohl *et al.* 2017). On top of their high GDP and budget allocated towards urban development and waste management, they have advanced equipment and resources that allow effective and efficient solid waste management. For instance, countries such as China, the US, Japan, and Germany have a high production and consumption activities indicating that their waste generation is massive. However, very little waste finds its way to the streets. Urban areas within China have strict policies regarding solid waste management and efficient approaches to manage waste.

Like in Beijing, garbage sorting across 46 cities is mandatory to reduce the waste menace that has over the years been criticized by other super powers like the US. Still, recycling of solid waste in China is heightened and done massively to reduce indiscriminate waste disposal. Cities like Tong Zhou which is identified to have large scale production activities have made it mandatory a public policy that waste collection and sorting is compulsory across 2,500 restaurants and all public institutions (Chen 2007). Technology has also advanced in these developed countries and urban areas such as in Germany, US, and Japan, as well as, China have introduced intelligent waste collection bins that can separate waste, reward credit systems that encourage waste recycling at home levels, green packaging approaches, and efficient dumpsites that can accommodate the quantity of waste produced.

In African urban areas things are slightly different in that solid waste management is a challenge by itself due to overpopulation and insufficient resources, less developed technologies, and ignorance when it comes to the need of a healthy environment. Consumption and local production activities are high but managing the solid waste produced is seen as a crisis due to low budgets that do not cover issues such as solid waste management. A study by Wilson *et al.* (2006) identified that the developing countries are faced with low national budgets and many conflicting needs such as poverty, hunger, malaria epidemics, cancer fight, among other needs that need more attention than waste management. Urban areas across countries like Algeria, Mauritius, Tunisia, Libya, South Africa and Nigeria, which are known to be more developed than other African countries, are still challenged by solid waste management due to conflicting financial demands at national level (Longe *et al.* 2010). In Kenya, things are similar, solid waste management within the urban areas is a menace and this

depicts that the government has lost control of the massive waste generation and the escalating population within these areas.

### **2.1.2 Informal waste management**

A wide research has focused on informal waste management particularly in the developing countries. A study by Bisong and Ajake (2001) carried within the Warri metropolitan claimed that the informal waste management sector is characterized by labor-intensive, low technology, small-scale, unregistered and largely unregulated activities. Such aspects translate to the idea that entrepreneurs investing in this sector are largely excluded in several social issues such as government insurance plans since they do not contribute to the public revenues through tax liabilities. Waste pickers carry out an informal business which does not require trading permits and licenses since informal waste picking is not recognized as a formal job. Another study by Wilson *et al.* (2006) found that developing countries such as Egypt, Colombia, Argentina, Mexico, and Costa Rica have large informal waste picking sectors where the primary activities in waste picking and recycling are carried by marginalized and poor social groups who purely rely on informal waste picking as the source of income (Wilson *et al.* 2006)

Depending with the waste management structure in a particular country, major developing countries tend to have four distinct categories of informal waste recyclers including the street waste picking, itinerant waste buyers, waste picking from dumpsites and the municipal waste picking crew. However, in urban areas within the Nigerian urban areas where municipal has failed to implement efficient waste management policies and regulations forcing street and dumpsite informal waste collectors to play a vital role in managing waste (Longe and Ukpabi, 2009).

### **2.1.3 Type and Sources of Solid Waste Collected**

The type of wastes that the informal waste pickers collect is dictated by the income attached or the use attached to it. Most of the wastes which are collected mostly have economic value. Waste pickers do not pick wastes for own consumption, rather they pick it to sell and earn money (Longe *et al.* 2009). Also, the waste is determined by the type of wastes which are mostly generated through consumption activities and waste pickers exclusively pick what they can collect and dispose easily.

According to a study carried in South Africa by Schenck and Blaauw (2011) the common types of solid wastes are used plastics, paper, scrap metals such as pans and pots and other metallic wastes, old electronics such as radios, phones, cloths ranging from rags to other useful ones. Waste pickers mostly go to residential neighborhoods, city designated dumpsites operated by municipalities and streets where the public dumps some of the solid wastes indiscriminately. The city dumpsites are major sources of solid waste because waste pickers just visit them and collect readily available waste discriminately depending on what they need. Additionally, for waste lying in the streets, waste pickers move around picking the waste using sacks and other bags on their backs or other means of temporal transport such as handheld carts.

According to a study carried out by Green (2013) solid waste management issue is the biggest challenge to the authorities of both small and large cities' in developing countries. This is mainly due to the increasing generation of such solid waste and the burden posed on the municipal budget. In addition to the high costs, the solid waste management is associated lack of understanding over different factors that affect the entire handling system. An analysis of literature and reports related to waste management in developing countries, showed that few articles supplied quantitative information. The objective of the mentioned studies was to determine the stakeholders' action/behavior

that have a role in the solid waste management and to analyze different factors that affect the system. The studies carried out in 4 continents, in 22 developing countries and on more than thirty urban areas. A combination of variable methods that were used in this study was mentioned in details in order to encourage the stakeholders and to assess the factors influencing the performance of the solid waste management in the studied cities.

Ubani (2015) notes that in almost cities and rural areas in Uganda, the menace of solid waste has posed great environmental problems due to the inability of the solid waste management agencies to carry out their responsibility. This is evidenced by the indiscriminate disposal of refuse on the streets, drainages and water bodies in most Ugandan cities. He observes that despite the government involvement in solid waste management, there has been no remarkable improvement. He recommends a policy that will anchor on community/private sector participation in solid waste management.

Chukwu (2013) notes that many cities in the country today, are suffering from sudden increase in solid wastes and their poor disposal. She observes that the volume of wastes resulting from plastic materials being littered in the streets, open spaces and public premises are becoming alarming. "These wastes are often discarded without due regard to environmental sanitation. Agbogu (2014) observes that Onitsha has been made uninhabitable due to indiscriminate disposal of waste by industries, poor implementation of legislation on waste disposal, inconsistency in waste collection by the Anambra State Environmental Protection Agency, as well as, the activities of town planning officials towards plan approval. Adesanya (2013) notes that poor evacuation of central refuse dump is a major factor influencing high volumes of solid waste in Nigerian cities.



Buckets and Smith (2016) enumerate the consequences of indiscriminate disposal of solid waste. According to them, “uncollected wastes often end up in drains, causing blockages which result in flooding and unsanitary conditions. Ugwunwa (2015) examines the causes and consequences of indiscriminate disposal of solid waste in Onitsha metropolis. She identified the causes of indiscriminate disposal of solid waste as carefree attitude, lack of environmental awareness, absence of disposal site and population explosion. The consequences she observes, are health hazards, poor environmental quality, pollution, and low scenic value of neighborhoods. She recommends immediate upgrading of the solid waste management system in Onitsha metropolis.

Owino (2012) and Otieno (2016) studied the solid waste management in some Kenyan cities with the aim of finding effective solution to the problem. They observe that the present sanitary conditions in most Kenyan cities are far from being satisfactory in spite of various measures undertaken to address the problem. Kimani and Henry (2011) observe that one of the most pervasive problems of contemporary cities in all regions of the world, especially the developing countries is solid waste management problem accentuated by the process of urbanization and urban development. In developing a new approach for efficient solid waste management in Kenya, they observe that there is need for proper sensitization of all stakeholders. This will enable them to agree, adopt and implement realistic action plans. They, are calling for re-orientation of the Kenyans towards achieving attitudinal changes through sound education and technological developments in the area of environmental management.

#### **2.1.4 Socio-economic issues associated with informal waste picking**

Poverty and unemployment in developing countries have been a driving force for the growth of informal waste picking sector due to the fact that part of the illiterate

and poor groups within the urban and suburban areas cannot raise sufficient income for their sustenance. Informal waste picking to them is viewed as a noble job which with no formal requirements (Charles & Remigios, 2015). A study by Asibor and Edjere (2017) examined the role of dumpsite informal waste collectors in Jordan and reported that, both unemployment and poverty are the major push factors towards creating informal waste picking sector.

The study added that the demand for recyclable materials within the industries acts as a pull factor for informal waste picking where the unemployed population sees it as an income opportunity. However, other studies by Bisong and Ajake (2001) focused on the negative effects that the informal waste collectors in Warri a state south of Nigeria on the society basing their argument that majority of the dumpsite informal waste collectors are street families or the “homeless” people who in most cases are associated with crime especially in the slum areas.

Another social effect that is directly associated with informal waste picking is the environmental effects resulting from their collection, separation and recycling. Existing research on informal waste picking has identified positive environmental benefits that accrue from this informal sector. Joardar (2000), based on his Indian-based study, claimed that it is hard to quantify the environmental benefits that accrue from the informal waste sectors. Based on a qualitative study, the authors reported that informal waste collectors help significantly in the reduction of both water and air pollution.

For instance, the collection of street wastes allows proper placement of the waste, depending on their types, in the right disposal places which would have otherwise been burnt by the residents. Solid wastes become water polluters when they find their way to open sources of water while uncollected solid wastes near residential areas are breeding sites for rodent vectors which specifically spread diseases including

malaria, diarrhea, cholera, typhoid, fever, Schistosomiasis and Lassa fever (Moreno-Sanchez *et al.* 2004). This study attempted to analyze the perceived environmental benefits accrued from waste pickers.

Further, another study by Wilson *et al.* (2006) claimed that informal waste collectors who mostly pick non-biodegradable materials for recycling reduce costs that would have been used in managing the municipal landfills. This indicates that they assist in prolonging the lifespans of these landfills. The municipal waste authorities end up reducing the costs allocated to the municipal's waste management since informal waste collectors do away with the solid waste along the streets that has to be collected and transported to the dumpsites. Informal waste collectors come into place in separating these wastes, for their own motives, despite the fact that the government waste authorities are not concerned with their efforts. Another economic benefit that is accrued with the dumpsite and street informal waste collectors is that they act as a cheap source of recyclable raw materials for domestic industries (Medina, 2000).

Wealth creation and job opportunities have been documented as other major effects of informal waste picking. Based on a study carried in Vietnam, informal waste picking is a significant source of employment for the poor people who are identified to be unskilled to fit in the formal job sector. Medina (2000) added that, in Latin America and Asia, despite the fact that poverty is a driving force of informal waste picking, it is cyclical depending with the economic cycles in Asia, it intensely appears during severe economic recessions. Such an aspect translates to the idea that informal waste picking is a major source of job openings for the developing countries (Moreno *et al.* 2004).

Dumpsite informal waste pickers are reflected as vulnerable population to different health hazards. A study by Imam *et al.* (2009) claimed that dumpsite informal waste collectors in Jordan are perceived as uncivilized and often ignored, a

key aspect that attributed to their elevated levels of psychological stress. Another study conducted in Vietnam by Nguyen (2000) reported that dumpsite waste pickers lack protective equipment/clothing for handling the waste such as animal and human faecal matter, broken glasses, bandages from hospitals and even containers with toxic solvents or chemicals; this is unhealthy as it exposes these informal waste pickers to increased risk of contracting disease.

The Informal Economy Monitoring Study”, coordinated by WIEGO (2014), supposed the quantitative and qualitative research of the complex issue of informal recycling activities, analyzing the opinion of 763 informal collectors coming from 5 cities of Africa, Asia and Southern America. Within this study, the main categories of economic benefits of informal waste recyclers have been identified. One of the benefits refers to the fact that the informal activity leads to the earning of basic incomes, which are absolutely necessary to provide the subsistence of informal collector’s households and families; the same aspect was identified by Rockson *et al* (2013), while Nzeadibe and Chukwuedozie (2011) agree that the average incomes earned by the informal collectors may be significantly bigger than the minimum incomes guaranteed in any social security system. For 65% of the respondents, the incomes earned from the informal waste collection and valorization are the main source of income, more than one quarter of the questioned informal recyclers not earning any other income.

The informal activities carried out by the informal collectors and recyclers allow the supply of recoverable materials to the concerned entities; according to the results of the study performed by WIEGO (2014), more than three quarters of the questioned informal collectors have declared that they have been capitalizing the recovered waste by trading them to formal recycling enterprises; in Pune, India, the informal recyclers collect organic material wastes in order to compost them and to produce biogas. Thus, informal

activities allow the authorized recyclers to extend their activity and waste recycling capacities and to enter new markets (Gunsilius, 2012). Matter et al (2013) believe that the informal activities supply secondary materials to the economic agents of the local market, which may contribute to the stimulation of the local population of recycled goods, to the development of the local market and community economy in general.

By collecting recyclable material wastes (packages, in most cases) randomly disposed of in public areas, the informal recyclers contribute to the provision of public cleaning (Afon, 2012; Asim *et al*, 2012). Gunsilius, Chaturvedi and Scheinberg (2011) claim, in the study they coordinated, that the informal recyclers manage to save an important quantity of wastes from disposal on landfills and waste dumps, which is the most significant ecological benefit of informal activities. The study shows that the informal recyclers from six municipalities of South America, Africa, Europe and Asia manage to recover almost 20% of the generated quantity of waste (in 3 of the 6 cities included in the study); more than 80,000 informal collectors have been acknowledged to be responsible for the recovery of approximately 3 million tons of waste per year in all 6 cities from the study.

The existence of the informal waste activities brings multiple benefits to the local authorities, responsible, in fact, with the issue of waste management at community level. In many under-developed countries, the informal collectors provide the unique form of urban waste collection, for the lowest cost, and sometimes without any financial obligation from the municipality part. Monirozzaman *et al* (2011) synthesize the benefits, for the local authorities, obtained from the existence of informal waste collection activities: create new jobs, reduce the quantity of stored wastes, extend the life of waste landfills, preserve primary resources and energy, reduce the pollution caused by waste etc. Regardless whether it is performed by formal or informal means, recycling

helps the community to „advance” towards the top of waste management hierarchy (Asim *et al*, 2012).

The informal waste collection and recycling activities contribute to the provision of public health and to the improvement of household and street sanitation, especially when the informal recyclers act in areas that are not served by urban sanitation services (Gerold, 2014). The municipal expenses related to waste management services are considerably reduced following the intervention of informal recyclers; Matter *et al*, (2013) warn that, while municipalities' costs related to waste collection tend to be reduced, it is likely that the expenses related to the treatment of waste may grow, following the fact that, through the informal activities, waste materials that may be capitalized are recovered by the informal collectors, thus reducing the quality of wastes in the official waste management facilities.

Recycling is without any doubt one of the cheapest and quickest methods to reduce greenhouse gas emissions, according to a research made by Tellus Institute (2013). The reuse, recovery and recycling of materials from waste, even by informal activities, contributes to the reduction of the quantity of raw materials necessary to produce and supply goods and services, and to the preservation of natural resources and energy (Gunsilius *et al.*, 2011). According to Habitat (2010), the informal collectors may provide the recovery of 50-100% of the amount of wastes generated in the cities of developing countries. By saving significant amounts of wastes from elimination through disposal, the informal activities of collection and recycling contribute to dumpsite life extension, which is translated into cost savings for the budget of the municipality.

### **2.1.5 Strategies and Regulatory policy Framework on solid waste in Kenya**

Thomas (2008) reported that the government's environmental regulations and legislations only focus on the municipal waste management policies. Similarly, Sharolyn *et al.* (2008) asserted that in Indian megacities, there are no legal operational controls on the informal waste management sector while the government only subsidizes the municipal authorities' waste management projects, leaving out the informal sector.

Kenya has legal frameworks to govern solid waste management. The Constitution of Kenya 2010 which is the supreme law in article 42 provides that every person has a right to a clean and healthy environment. It further guarantees the right to have the environment protected for the benefit of the present and future generations through legislative and other measures. It does not break down what other measures are as well as how the legislative will achieve protection of the environment. Article 69 imposes the state is required to ensure sustainable exploitation, utilization, management and conservation of the environment. This research shows how the waste pickers in the informal sector ensure sustainable exploitation and utilization of the solid waste which leads to conservation of the environment.

In addition to the constitution there is the Environment Management and Coordination Act (1999) EMCA enacted as a law on the environment. EMCA provides for the growth of other subsidiary guidelines and laws to regulate the environment management including solid waste management.

The National Environment Policy (2013) was formulated by the Ministry of Environment, water and natural resources. This policy contains statements on waste management strategy. According to this policy the government will develop an integrated national waste management strategy, promote use of economic incentives to

manage waste, establish facilities for cleaner production, waste recovery, recycling and reuse.

There is the Waste Management Regulation (2006) which provides that no person shall dispose any waste on a public highway, street, road recreational area or in any public place except in a designated receptacle. It goes on to state that any person whose activities generate waste shall collect segregate and dispose of such waste in a manner provided under the regulation. Any person whose activities generates waste has an obligation to ensure such waste is transferred to a person who is licensed to transport and dispose of such waste in a designated waste disposal facility. Any person whose activities generate waste shall segregate the waste by separating hazardous waste from non-hazardous waste and shall dispose of such waste in such facility as is provided for by the relevant local authority.

The Nairobi City County Solid Waste Management Act 2015 provides that solid waste management shall be a shared responsibility amongst actors who include the county government, generators owners and occupiers of the premises and contracted service providers. The executive committee member shall allow and facilitate participation of all person this includes corporate entities, individuals, community and neighborhood associations in all aspects of SWM in order to attain high and sustainable standards of SWM. In addition the executive committee member shall establish guidelines through regulations to and undertake activities to facilitate and promote recovery of waste of waste materials through reduction, recycling, reuse and composting of waste by various actors in SWM.

The act goes on to provide that the County government shall promote and ensure public education to enhance awareness and knowledge of all stakeholders on general and specific aspects of SWM as well as promote and sustain practical steps to ensure



that waste is managed in a manner likely to protect human health and the environment against adverse effects which may result from waste.

Kenya aims to be a nation that has a clean, secure and sustainable environment by the year 2030. The vision 2030 comprises of economic, social, political and foundations pillars. Under the social pillar is the environment, water and sanitation. The environment sector aimed to involve specific strategies which include promoting environmental conservation to provide better support to the economic pillar flagship projects, improving pollution and waste management through design and application of economic incentives, commissioning private-private partnerships (PPPs) just to name a few.

The aforementioned policies and frameworks have not mentioned the informal sector in SWM. This translates to the idea that there is little or no existing regulatory policies governing informal waste picking activities in Kenya. However there is a call for various actors to participate in solid waste management. One major weakness of these legal platforms within the Kenyan context is that they have not incorporated the informal waste management sector. In addition they have assumed that waste control and management is an exclusive role of the national and county governments (Muniafu *et al.* 2010). This research will highlight the contribution of waste pickers to informal waste management.

### **2.1.6 Hierarchy of informal waste picking business**

As much as existing studies on the impacts of informal waste picking associate it with wealth creation among other economic benefits, the manner in which the recycling activities are organized influences the amount of income generated, social status, and working conditions of the informal waste collectors. Such an aspect

translates to the idea that informal waste recycling sectors that are less organized have a high chance of engaging people towards adding value to the materials collected while intermediate dealers stand a high chance of exploiting the individual waste pickers or the informal waste collectors (Wilson *et al.* 2006).

There is a chain of intermediate dealers who exist between the end-users and informal waste collectors such as the medium-sized recyclers, brokers, wholesalers, junk shops and other secondary dealers. Such an aspect shows that, there is a hierarchy of dealers within this informal waste management sector starting from the informal waste collectors to the end-users (Thomas, 2008). The higher the secondary materials are traded, the higher the added value they possess; while the informal recyclers are restricted to the hierarchy involved in producing a particular secondary material.

The waste pickers occupy the lowest level in the hierarchy and are most vulnerable to low income since they tend to lack well-organized supporting networks. Also, the informal waste collectors do not have financial capacity to possess storage or processing materials and equipment making them easily stand a chance of being exploited. However, the existence of family-organized activities within the dumpsites tend to provide economic and social support to the informal waste collectors perhaps to reduce the chances of being exploited (Wachukwu, Mbata, and Nyenke 2010).

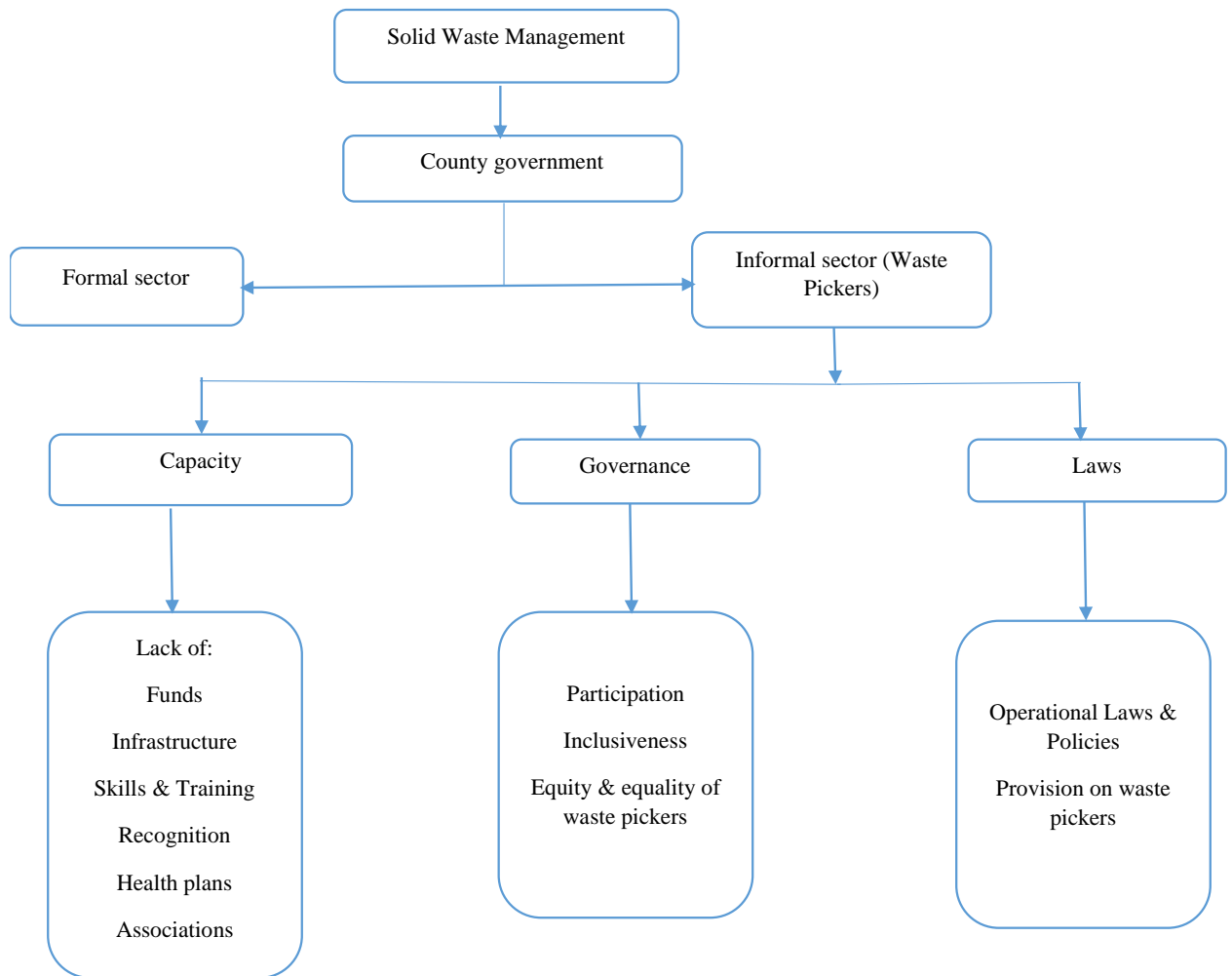
## **2.2 Theoretical Framework**

### **2.2.1 Structuralism Theory**

From a structuralism approach informal waste picking is embraced as an integral part of a capitalist system providing a link between the demand from formal enterprises and recyclable materials. According to Bichi(2003) having access to cheap recyclable materials, local enterprises are able to significantly reduce production costs, hence ultimately increasing their income. Simultaneously, waste pickers are able to earn

income. The large industries are constantly in demand of recyclable materials and rely on hierarchy of intermediaries to access them – where informal waste collectors (who are self-employed) play a vital as they are a source of such materials (Haan *et al.* 2008). Further, informal waste collectors help in wealth creation in this informal sector as most enterprises prefer recyclable materials from informal waste collectors rather than employing formal employees to go collect the materials for them. Therefore, the structuralism approach claims that informal waste picking is essentially pro-cyclical to economic effects: they expand local domestic industries; helps create wealth and is a source of income to waste pickers (Daradki 2008). Therefore, this framework is vital in explaining the economic impact of informal waste collectors in developing countries.

## 2.3 Conceptual Framework



Source: (Author, 2017)

**Figure 1: Conceptual Framework**

In this study, waste pickers form the independent variable while solid waste management is the depended variable, they are moderated by capacity, laws and governance. The conceptual framework therefore is the nature of relationship between the variables of the study. According Mugenda and Mugenda (2003) conceptual or definition of a variable is a way of specifying precisely what we mean when we use a particular term or refer to a variable. In this study, the dependent, independent and moderating variables mean as described below;

Waste pickers an independent variable is a person who salvages reusable or recyclable materials thrown away by others to sell or for personal consumption. There are millions of waste pickers worldwide, predominantly in developing countries, but increasingly in post-industrial countries as well. In many countries, waste pickers contribute significantly to waste management and resource efficiency by collecting, sorting, trading and sometimes even processing waste materials. These activities also provide an income opportunity for large numbers of poor people. This is effectively serving as a mass subsidy for city governments, who do not pay for the labor.

Environmental governance moderating variable in informal solid waste segregation and recycling addresses the inadequate infrastructure, financing, lack of clear roles and responsibilities of these authorities and uncollected and uncontrolled disposal of waste which have made the task more difficult, hence public health and sanitation is threatened by increased unplanned dumpsites. Waste management systems in Kenya currently are not well maintained at household level since thousands of tons of functional solid waste are generated daily end up in open dumps and wetlands, contaminating surface and ground water and posing major health hazards to human beings and the environment.

Laws moderating variable are operational laws & policies which waste pickers in many places have form to advocate for their rights to inclusion in municipal planning. Waste pickers lack formal recognition and may work at the whim of local officials. The services that waste pickers provide, and the support they require to provide those services, may not be accounted for in municipal planning. And, like workers in many sectors of the informal economy, waste pickers are generally excluded from social protection schemes. That's problematic because of the heightened health and safety risks that they face.

Capacity moderating variable in this study is the specific organizational capacity needs which are in the area of funding, infrastructure and facilities, technical skills and health plans, policy, systems and procedure and institutional arrangements and coordination.

#### **2.4 Summary and Research Gap**

Based on the literature review, several issues can be pointed out. First, most research has embarked on dumpsite waste pickers and appears to generalize this informal sector to be composed of only this type of waste pickers despite there being street waste pickers, itinerant waste buyers among others. Street waste pickers move along the streets and residential areas collecting wastes while dumpsite informal waste pickers wait for waste in the dumpsite. Therefore, focusing on the street waste pickers is a research gap that needs to be filled. Second, there is no documentation that has quantified the amount of waste collected by the informal waste pickers. Most research focused on the amount of waste produced by various human activities in the developing countries, therefore, assessing the quantity of waste collected by a single waste picker in a day or week would offer an opportunity to evaluate the economic value attached to this informal sector.

Third, it is clear that most research has focused on China, India, Mexico, Egypt and Nigeria as their case studies a key aspect that leaves a potential research gap when comparing these countries with Kenya, and more so a small city like Nairobi. Ideally, the above mentioned countries are far much ahead of Kenya in terms of population size, human development, social stratification and technology wise which are key aspects that influence production and consumption processes. For instance, when comparing Kenya and China, there is a large discrepancy in terms of production, as Kenya relies heavily on importation of goods, but China relies heavily on exports to other developing

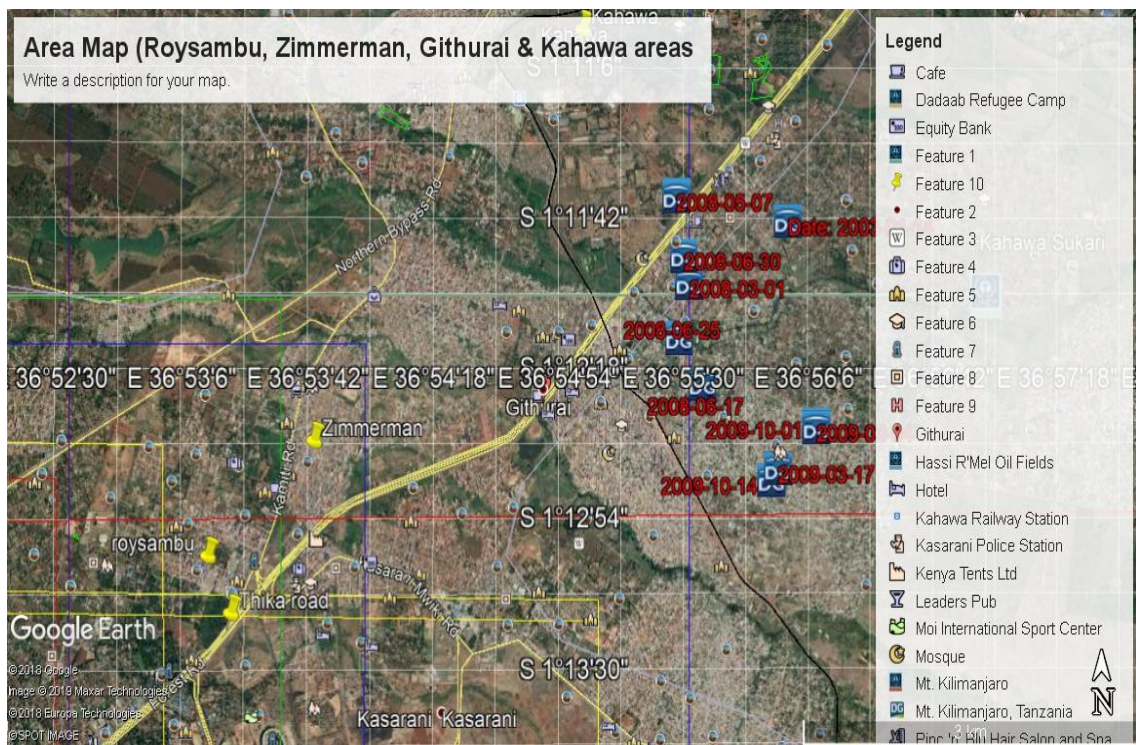
countries. Therefore, the level of waste production and disposal would also be different. Such an idea leaves a gap to be filled particularly in evaluating the position value, and role of informal waste collectors in a country that has low production activities, escalated rural-urban migration, as well as, poor recycling technologies.

## CHAPTER THREE: MATERIALS AND METHODS

### 3.1 Introduction

The chapter reflects on the research design that was used to carry out the study that is data collection approach and statistical analysis to answer the research questions. Also, it reflected on the sampling technique that the researcher adopted to select the study subjects, and the ethical concerns which guided the researcher during the data collection exercise.

### 3.2 Study Area



**Figure 2: Map showing Selected Research Areas**

*(Retrieved from Google Mapson 04/10/2019)*

Nairobi is one of the most populated counties characterized by seventeen densely-populated constituencies. Ideally, it also holds the capital city of Kenya (Nairobi) which is an urban area and one of the most leading polluted regions in Africa resulting from its tremendous population growth rate. This county has the leading number of dumping sites across the city and its peripheral areas, however, over the years waste has become



uncontrollable forcing informal waste pickers move around the streets, walking paths, and residential areas collecting solid wastes and taking them to recycling units.

The study focuses on Roysambu Constituency which is within Nairobi County. Roysambu has an approximate of 202,000 (KNBS, 2009). The constituency has an area of 48.80 sq. km and has five wards including Kahawa West, Githurai, Zimmerman, Roysambu, and Kahawa. Out of the five wards, Githurai Ward is the most populated with more than 47,194 people as of the last census with Kahawa Ward having the least number of people in the tune of 35,853 people. It has several neighborhoods such as Thome, Garden Estate, and Balozzi which are associated with an upper class or high-income people owning their own homes and high-end residential bungalows (National Government Constituencies Development Fund Board, 2018). However, other neighborhoods in the Zimmerman, Kahawa West and Kahawa are characterized by middle-class residences who mostly live in rented residential houses while some parts of Githurai are characterized by a high number of low-income residences residing in poor residential houses and “iron sheets” houses. Other noticeable neighborhoods include the National Youth Service headquarters, the United States International University, Kamiti maximum prisons, Kahawa Barracks, and the General Service Unit headquarters (NG-CDF, 2018).

The Roysambu residents enjoy a wide range of economic activities. For instance, part of the constituency is connected to the Thika Superhighway and Southern by-pass that links the neighborhoods to the Nairobi City. Transport activities is one of the main economic activities since most residents occupy the middle- and low-class income and have no personal means of transport. The area has matatu Sacco owners who operate personal PSV vehicles. Also, some parts of Kahawa and Kahawa west are strategic for small scale faming with Sukuma wiki being the main crop though it is

traded within the neighborhoods. Zimmerman, Kahawa, Kawaha West, and Githurai also enjoy wide opportunities of private businesses ranging from clubs and pubs and other entertainment joints, rental houses (real estate), private health facilities, hotels, supermarkets, schools, and small-scale shops.

The low-income neighborhoods within Roysambu have a high number of solid waste pickers who engage in the business informally. Despite the fact that some of the neighborhoods are on the high-end income class, low class neighborhoods within Zimmerman, Githurai, and some parts of Kahawa are characterized by high levels of unemployment and high residents with low education levels. Furthermore, the population density is high and drainage infrastructure is very low and this depicts that solid waste collection and management is a challenge with lots of solid waste still lying on the streets indiscriminately in most areas (Kimani, 2016).

Despite the efforts of the county government to carry out waste collection and disposal, it is only done once a week meaning there is more waste lying along the streets uncollected. This has been an opportunity to many waste pickers within these neighborhoods to engage in collecting solid waste for sale. Furthermore, the selected area was easily accessible for the researcher in terms of time and accessibility of the solid waste pickers because they are plenty and strategically placed in some specific areas where most solid waste is dumped.

### **3.3 Research Design**

The research used the mixed method approach which played a key role in understanding contradictions between quantitative results and qualitative findings. Creswell and Plano 2011 describe the mixed method approach as focusing on collecting, analyzing and mixing both quantitative and qualitative data in a single study or series of studies. Greene 2007 believed that this approach provides researchers with

opportunities to compensate for inherent methods strengths and offset inevitable method biases. Through this approach the researcher assessed the various insights which explain the environment effects of street informal waste collectors on the informal solid waste management sector. Based on this scenario, the researcher utilized qualitative research approach to seek quantitative information of waste that the street informal waste pickers collect in a day on average, employment opportunities created, evaluate the chain of waste collection, as well as, the challenges that these informal waste pickers undergo in their lines of duty. To achieve this, the research used semi-structured interviews as the research instruments.

### **3.5 Sampling and Sample size**

The study utilized convenience sampling which is a non-probability sampling technique, to recruit representative participants of the targeted population. Convenience sampling is where the researcher chooses a sample conveniently available to him or her. This method relies on data collection from members of the population who are conveniently available to take part in the research. The researcher specifically visited strategic areas where to find these informal waste pickers and more so, identify those who can communicate at least in *Swahili* language, a language the researcher speaks.

The study targets informal street waste pickers within Roysambu Constituency. The constituency has a population of about 202,000 people though there is no comprehensive statistics existing on the number of people who carry out informal waste picking. However, according to a report by the National Government Constituencies Development Fund (NG – CDF) (2017) the number of waste pickers within the constituency lies between 2-4% of the total population. This was done until a sample of 196 participants was realized. The sample size was determined using the formulae below.

### *Computing the sample size*

$$\text{Sample Size} = n = z^2 (p) (1-p) / c^2 \quad (\text{Cochran, 1977})$$

Where:

$z$  =  $z$  value for 95% Confidence Level

$p$  = 0.5

$c$  = confidence interval 0.07

$$\text{Sample size} = 1.96^2 \times 0.5 \times (1-0.5) / 0.07^2 = 196$$

Sample size = 196

### **3.6 Data collection procedure**

To elicit information and data from the street informal waste pickers, the researcher used semi-structured interviews as the main research instrument. Ideally, this type of an interview had both closed and open-ended questions. Closed questions focused on collecting factual and numeric data while the open-ended questions collected information based on participants' views, feelings and opinions. Further, the open-ended questions allowed the researcher to dive deeper and ask clarification questions or insights (Marshall *et al*, 2014). The researcher recorded the information for analysis to get quality information (group it according to the themes coming out) and draw conclusions.

### **3.7 Data Analysis**

Data collected from the field was managed on Statistical Package for the Social Sciences (SPSS) spreadsheet for statistical analysis and presentation. Tables and graphs were used to represent the study findings. The researcher grouped the qualitative categorical or nominal data based on the research objectives and themes coming out for reporting and comparing it with the existing literature to identify any inconsistencies.

To test for the hypothesis the researcher measured and examined a random sample of the population that was being analyzed.

### **3.8 Ethical Concerns**

The researcher observed all the research informed consent principles. In this case, the researcher read and explained the research consent orally to the study subjects especially on the purpose of the study. The researcher also assured the respondents that their names and other personal credential would remain anonymous while the data collected would exclusively be used for purpose of the research. Further, the researcher explained how the respondents' utterances would be used in the report. Nevertheless, the researcher informed the respondents that the participation was voluntary and they had the right to withdraw at their own time during the research or during any active interview session.

## **CHAPTER FOUR: RESULTS AND DISCUSSION**

### **4.1 Introduction**

The chapter presents the study findings as reported and analyzed by the researcher. The findings are reported based on the study objectives mentioned in Chapter one and respective research questions. The first part of the chapter presents the

overall descriptive demographic data for the participants. This chapter combines results and their respective interpretations, as well as, discussion while relating them with the existing research discussed in the literature review.

**Table 1: Demographic Statistics of the Participants**

<b>Variable</b>	<b>Category</b>	<b>Percentage (%) n=196</b>
Gender	Male	93
	Female	7
Marital Status	Single	54.3
	Divorced	45.7
Education	Primary	62.75
	Secondary	37.25
Housing	Iron sheets	82
	Dumpsite and Streets	9.5
	Others	8.5
Age	Below 10 years	12
	Between 11 – 20 years	54
	Between 21- 30	22
	Above 30 years	12

The gender results on Table 1 above indicate that males are engaged most in informal waste collection than their female counterparts. This is explained by the factors such as the need to provide basic necessities for their families, financial crisis for the jobless people within the urban areas and supposedly that men are resilient and persistent to such harsh conditions that surround scavenging and other informal solid waste collection activities. A study by Cointreau(2006) on sub-Saharan countries,

reported that most males carry out the waste collection in the dumpsites and the streets. This depicts the vulnerability of this waste picking population.

The study found that a large number of the study participants were single (54.3%) with 45.7% reporting as divorced. Based on exploratory questions to gain deeper insights on these findings, several participants claimed that, marriage became impossible the time they started moving around the streets collecting waste. It was unbearable for their loved ones to cope up with them. Further, the waste collection activities have little income that can sustain families within an urban setting like Nairobi. Other participants asserted that the waste collection is tedious and one has to move around the whole day until late hours to ensure they secure some cash for the day and this becomes hard to balance between family and their work hence their wives left. Bichi and Amatobi (2013) claimed that informal waste pickers earn very little income for their living and this cannot support families especially within the urban areas. The study added that these social groups are discriminated on especially within the developing countries as they are associated with crime hence this becomes a hindrance to enter in matters love or relationships that would yield to marriage.

The study reported that most of the informal waste pickers interviewed had primary level education (62.75%) while 37.25% had secondary level education. In Nairobi County, around 51% of the county residents have secondary education and above, while at least 38% have primary education (KNBS, 2017). Considering a country's education system, these two education levels are the lowest when ranked. Such an aspect indicates that the informal waste collection in the dumpsites and streets is carried mostly by ill-educated people especially school drop-outs. For instance, waste

collection is a noble job for the ill-educated especially in the developed countries. However, in developing countries, it seems for the ill-educated people who cannot fit in the formal job sector. With the heightened unemployment rates, most ill-educated people within the urban and suburban areas are finding their way to the informal jobs in Jua Kali, waste collection included since they can still reap some income for their basic needs.

The state of housing is one of the key indicators of development and a determinant of social welfare in any country. The waste pickers lack decent housing. Most informal waste pickers stay in the iron sheets(iron sheets) houses in the remote areas within the suburban areas (82.0%) while others have no houses of their own and stay in the dumpsites and streets which are the main areas where they carry out the waste collection activities (see Table 1). Some are accommodated by their relatives but they wake up into the streets for the waste collection job. The findings are consistent with study by Ezeah(2010) who reported that the street waste collectors have lacked modernized housing facilities and they majorly rely on temporary structures constructed around the dumpsites as they wait for waste to be brought from the urban areas. Those who can afford for accommodation do live in very cheap houses adjacent to dumpsites to cut any transport costs.

#### **4.2 Sources and Components of the solid waste**

The first objective of the study aimed to analyze the sources and components of solid waste collected by the informal waste pickers and how it is treated. The study focused on assessing various indicators and issues surrounding the waste collected to clearly bring out the picture of how this informal industry is and understand the role these waste pickers play in this sector especially within a developing country.



#### **4.2.1 Components of the solid waste collected**

The study found that informal waste pickers collect a variety of solid wastes in their daily activities. Some of the wastes collected include organic material, plastic containers and bottles, paper, glass, scrap metals, electronics and old tyres among others. Such items result from consumption activities by consumers and by-waste from mini-industries within the town areas. Out of these types of waste, plastic containers and bottles were the most common type of solid waste that many waste pickers collected 35%. Glass was the other common type of solid waste that was of interest to the waste collectors with 18% showing interest in it. Scrap metal and aluminium cans were also identified to have some importance 12% and 10% of the participants reported interest in these two respectively. Very few waste pickers showed their interest in plastic bags, clothes, organics, bones, electronics and rubber. However, some respondents confirmed that when they do get a buyer for bones, electronics and others, is when they collect these items.

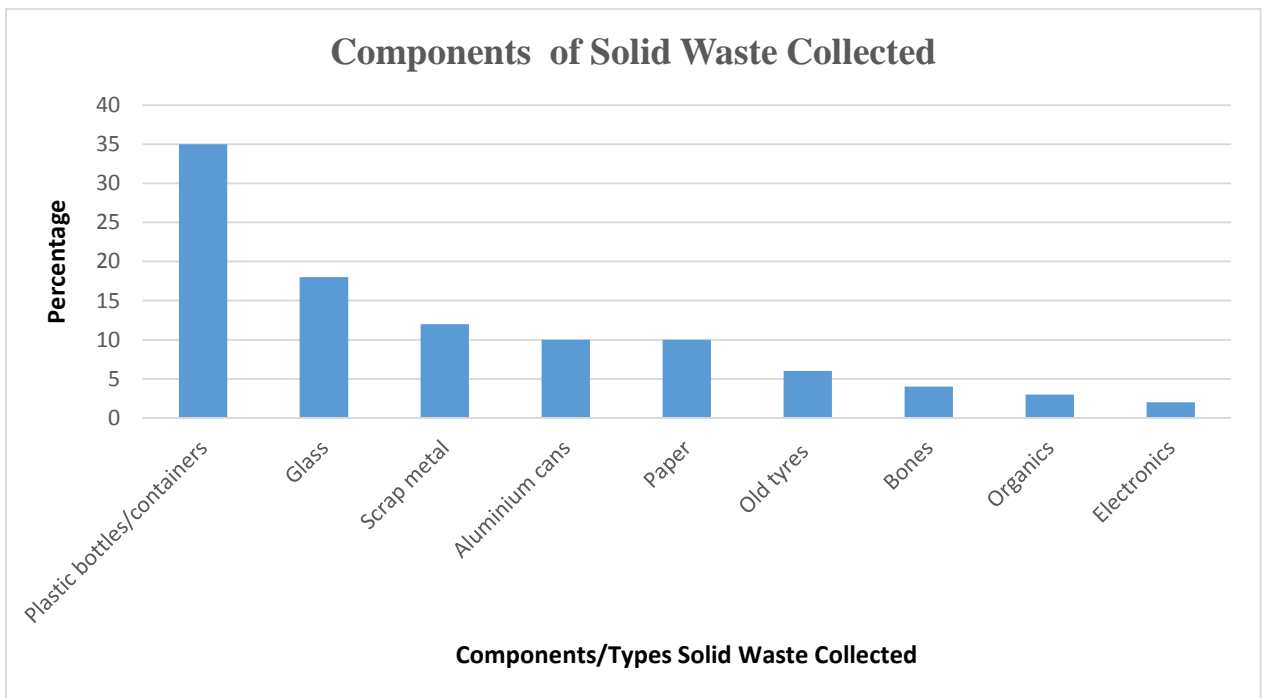
The study findings were in line with the studies by Medina (2000); Rathi (2006); Zad (2011) that reported that most of the street waste pickers were interested with the most earning solid waste when taken to the brokers or industries. The interest of these waste pickers is highly influenced by their demand, especially in the recycling industries. Additionally, some of these wastes depend on their availability, attached value and the value generated from them when they are recycled, as well as, the proximity of millers that exclusively deal with such materials (Zad, 2011). The Jua kali

industry in Kenya is very stable and has most of its products relying on scrap metal, glass and plastic materials. This rationalized why majority of the waste collectors valued scrap metals, glass and plastic materials which have more value than other materials. Plastic materials are further segregated into clear bottles or containers and colored containers. Reason being when taken to the manufactures it is easy to add color to the clear containers hence colorful merchandise such as buckets and basins which are the end product.

Operator owners for the recycling units or brokerage destination claimed that they received a wide array of solid waste materials as indicated in the Figure 1 below. Such an aspect indicates that most of the solid waste collected from the streets is taken to brokers who take it to the industries for recycling or get walk in customers who want a particular waste for their own consumption. Based on these statistics, the plastic materials have the most attention from the waste pickers and this is associated with the economic value associated with them (Zad, 2011). However, there are types of materials that are probably not acceptable or they are not in demand such as copper, aluminium plates and plastic bags. There have been cases where people have vandalized and stolen copper and aluminium cables belonging to Kenya Power and lighting company and sold them to scrap metal dealers. Police have been investigating these incidences and there is fear of collecting copper and aluminium plates so as not be mistaken with thieves.

A few respondents indicated that they still have an interest in copper and aluminium plates, there is a high chance that these two types of materials are reused without any modification. Studies by Rocio *et al*, (2003) noted that some of the goods collected have value by their own before being modified or recycled. Such an aspect is true based on this study. Five of the participants that collected these materials asserted

that some of the copper and aluminum materials collected are wires which are used as clothing lines in the slums. Therefore, such an aspect tells that, they still have value which is more personal than industrial, the waste pickers sell them to individuals in need of them. Plastic bags are not popular as well because of their flimsy nature. Majority of the respondents confirmed that collecting the plastic papers and filling a sack with these papers is tedious.



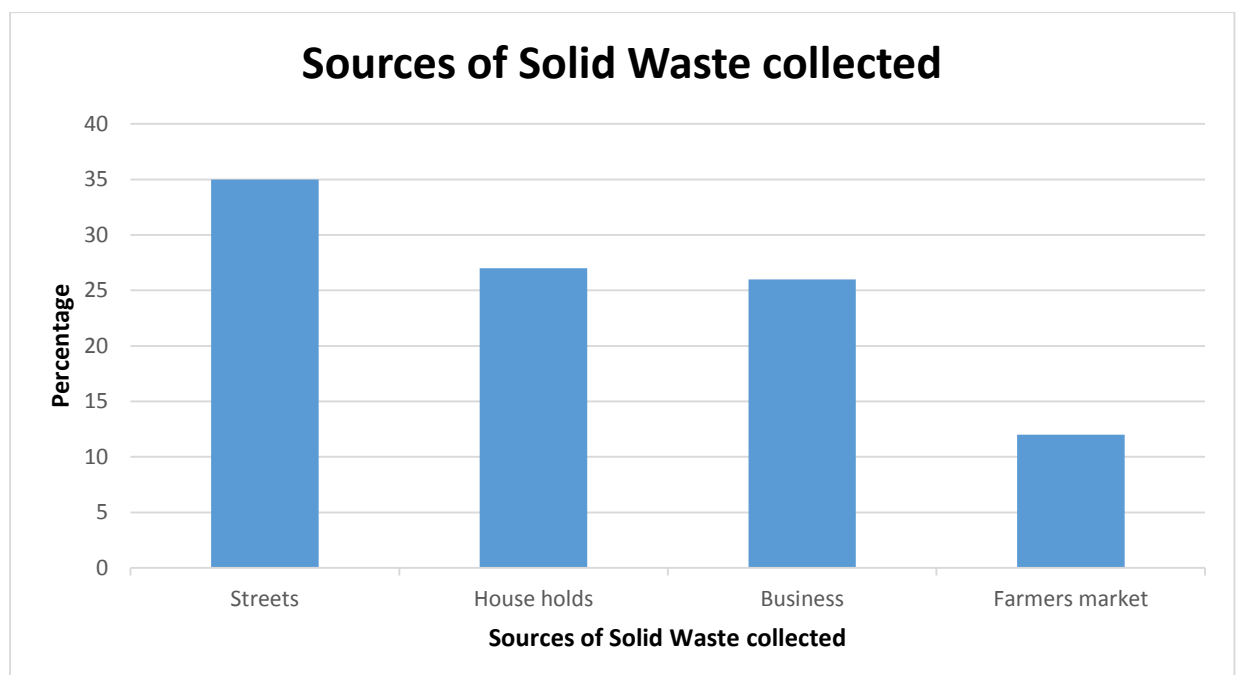
**Figure3: Components/Types Solid Waste Collected**

#### **4.2.2 Sources of solid waste collected by waste pickers**

The study treated the waste source as any object, area, activity or person producing solid waste that finds its way to undesignated places. Based on the study, the streets were the main source of waste followed by households. Farms and businesses were also salient sources of solid waste, with little waste coming from other non-identifiable sources. About 35% of the respondents noted that most solid waste came from the streets while 27% of them noted that it came from households. About 26% of

them claimed that solid waste came from businesses, while 12% citing farmers' market as a source of waste.

Actually, due to factors such as overpopulation and ineffective solid waste regulation in the urban areas it has become a challenge to curb indiscriminate solid waste disposal. Particularly in residential areas and streets within Nairobi, where there is over population and this is one of the major factors that has led to uncontrollable solid waste production resulting from increased consumption and manufacturing activities (Henry *et al*, 2006). The studies by Bichi and Amatobi (2013) conducted in Sabongari, Northern Nigeria, on household waste management concluded that poor solid waste regulation in the developing countries is a major setback towards effective waste control and more waste indiscriminately finds its way to the streets. There are no regulatory policies that direct the waste disposal and this has changed peoples' culture towards waste disposal it appears as a norm to dispose waste any how without reflecting on its human health impact (Adeyemi *et al*, 2001). The irresponsible behavior of indiscriminate waste disposal and littering makes citizens deny themselves a healthy and clean environment as much as it remains a constitutional right.



## Figure 4: Sources of Solid Waste collected

### 4.2.3 Average Waste Quantity Collected

The study focused on identifying or estimating the quantity of solid waste that the informal solid waste pickers collect. Such an aspect aided in assessing the economic value which the collected waste affords the people in this sector. For instance, the researcher estimated the total waste in terms of kilograms (kgs) that the participants collected within seven days, and from the different sources. Based on the study findings, it is clear that a high volume, on average, came from plastic bottles and containers, glass and scrap metal. On average, each participant collected 163 kgs of plastic bottles and containers, 109 kgs of glass and relatively lower quantities coming from bones, organics as well as electronics, among others as shown in Table 2.

**Table 2: Average waste collected from various sources in seven days weighed in Kilograms**

Type of waste	Households n = 196	Street n = 196	Market n = 196	Business n = 196	Total	Average Per Collector
Plastic bottles/containers	45	50	28	40	163	40.8
Glass	39	35	5	30	109	27.3
Scrap metal	13	40	8	15	76	19

Aluminum Cans	20	25	5	10	60	15
Paper(carton, brown paper)	15	18	3	22	58	14.5
Old tyres/ rubber	2	7	9	18	36	9
Bones	12	5	4	13	34	8.5
Organics	8	7	10	6	31	7.8
Electronics	6	20	0.5	1	27.5	6.9
Copper	0	0	0	0	0	0
Clothes	0	0	0	0	0	0
Plastic bags/ trash bags	0	0	0	0	0	0
Total	160	207	72.5	155	594.5	148.8

Considering the above findings from the study on the average waste collected, several aspects can be pointed out. One aspect is that the quantity collected is driven by the availability and economic value attached to the type of waste. In this scenario, plastic materials have the most availability than the other wastes. Plastics in the developing countries such as Kenya are heavily relied on in the recycling industries, in making useful products such as containers, tanks, buckets and basins among others. According to a study by Schenck and Blaauw (2011) carried in Pretoria, a significant source of plastic recyclers is the local waste pickers who through brokers solicit huge quantity of plastics.

In this scenario, glass materials have the most availability after plastics that the other wastes. This is because of the simple and affordable practices that people use to recycle glasses and ensure a clean and safe environment. This is why in Kenya recycling waste glass is contributing in creating a better and cleaner but also more profitable world.

Further, the study noted that the plastic waste is easy and cheap to recycle and its end-products have a high demand. Another study by Adeyemi and Olorunfemi (2001) added that most of the developing countries such as Nigeria have high demand of plastic products and this is identified in this study. The participants noted that the plastic wastes have high demand which implicates high demand and economic value. Furthermore, the streets prove to have the highest quantity of waste and this narrates that the current existing waste control policies within Nairobi County have not been successfully enforced. Despite the fact that the SWM is one of the environmental SDGs embedded in the Vision 2030 flagship, Solid waste management remains a salient environmental challenge.

#### 4.2.4 Average Revenues Collected

Based on the quantity of the wastes collected the researcher estimated the total revenues that each participant earned from solid waste collection for a single week. The total kilos were multiplied by the average price per kilo to calculate the revenues per head in a week. Based on the findings presented in Table 3 below scrap metal had the highest revenue on average based on an average of 76 kgs (Ksh. 2660); plastic bottles and containers had based on an average weight of 163 kgs (Ksh. 2445) and glass was reported to have average revenues of ksh. 2180, based on an average of 109 kgs. Other solid wastes had significant revenues as seen from the Table 3 below. Within the week, an average of ksh 10223 was earned as income per head and this indicates that this sector can be a source of living for most unemployed people.

**Table 3: Weekly Income generated by waste pickers from selling solid waste**

Type	Price Per Kilo (KSh)	Total Kg n= 196, M = 128.33, SD = 109.0991	Revenues (KSh) n= 196, M = 1,286.58, 1,209.53
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	n = 196, M = 10.75, SD = 5.5452		
Plastic bottles/ containers	15	163	2445
Glass	20	109	2180
Scrap metal	35	76	2660
Aluminium Cans	15	60	900
Paper(carton, brown paper)	10	58	580
Old tyres/ rubber	15	36	540
Bones	10	34	340
Organics	8	31	248
Electronics	12	27.5	330
Total		594.5	10223

The study reflects on the common types of solid waste that are collected by most of the street or informal waste pickers. Tentatively, it is clear that different wastes have different economic value measured in terms of Kenya Shillings and a source of income for these people. The variation of prices of these wastes clearly indicates that each one of these types has its own economic value- and the variation is influenced by various systemic and exogenous factors that these waste pickers cannot control. Some respondents clarified that the income stated above is not the same for every waste picker because different brokers have set different prices. Another factor to consider is the



demand for some waste is seasonal. For instance, there are times when demand for plastic containers is high and sometimes the demand is low.

The study findings are consistent with the existing research by Goswami and Sarma (2007) who explored the economic value that informal waste management affords a developing economy. The study reported that developing countries have a high dependence on secondary materials from used goods especially in their mini or small-scale industries that are exclusively used for recycling waste products. Recycling has its heart due to the fact that there is sufficient supply of used goods and waste especially in the urban areas. However, the value attached to these wastes varies due to the economic value of the finished goods produced after recycling.

For instance, scrap metal is a very useful raw material in the small scale recycling industries (jua kali) as it is used to manufacture secondary metallic products such as wires, drums and containers that have a high importance among the low income earners. In addition the Jua Kali sector relies on these materials to make other products sold in the remote areas which have economic value. For example, metallic boxes, wheelbarrows, jembes, ploughing tools, seats, beds and other products, all which rely on the solid waste as the main raw material.

Other materials such as rubber and tyres are used to make shoes, paint, carbon black powder, industrial diesel oil which is used for heating and generating power, among other products. Within the Kenyan scope, scrap metal, plastics, glass and rubber are useful materials and inputs for manufacturing industries. The prices of these waste now vary depending on the perceived use of the raw material and the finished good. The high demand for finished Jua Kali goods have their raw materials (waste) priced higher than wastes that is not recycled or whose recycled products have no significant demand.

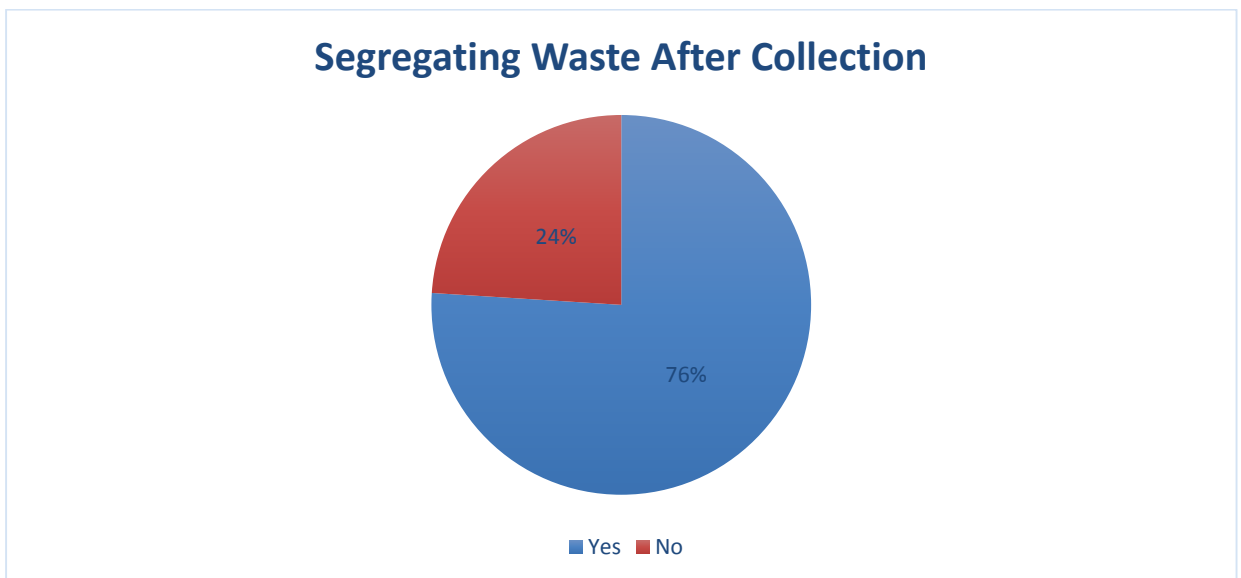
However, with the wide array of socio-economic challenges that the informal waste pickers go through the above results indicate that, if these challenges are eradicated, the informal waste management is a potential source of income for many Kenyans. If on average a person can make Ksh. 10,223 in a single week, then it depicts that the informal solid waste sector can absorb more people who can make their livelihood out of it. Furthermore, improving governance indicates formalizing the sector and this is bound to change the peoples' stereotypes and perceptions of the "chokoras" and replace the existing idealities with the notion that the waste pickers help Kenyans enjoy the right to a clean and healthy environment. This is a potential sector that can be relied for survival. The key implication here is that the employment rate will increase overall.

#### **4.2.5 Segregating Waste after Collection**

The study found that a majority of the informal waste pickers segregate their wastes during collection. About 76% of the respondents agreed that they segregated their waste when collecting it while 24% claimed that they just pick different waste and deliver it. Segregation took place either during waste collection or at the point of sale. Solid waste segregation is driven by the type of end waste required especially by the brokers or the price attached to each of the different types. For instance, most of the

destinations of these wastes required a particular type of waste such as plastic containers, paper or scrap metal as a standalone waste. Such an idea indicates that the waste pickers need to segregate it before taking each particular waste to its destination.

Most of the waste handlers or brokers do not have efficient waste segregation machinery and equipment hence they prefer readily sorted waste which can be directly taken or sold to the recycling mills. The segregation findings in this study have several implications regarding the sustainability policies. For one, they imply that the capital machineries and equipment used in recycling process in Kenya are insufficient and this is a challenge that can make the informal waste sector not to expand. Consequently, this translates to the idea that achieving a sustainable environment is a challenge since the country has no sufficient capacity to handle solid waste efficiently within the urban areas.



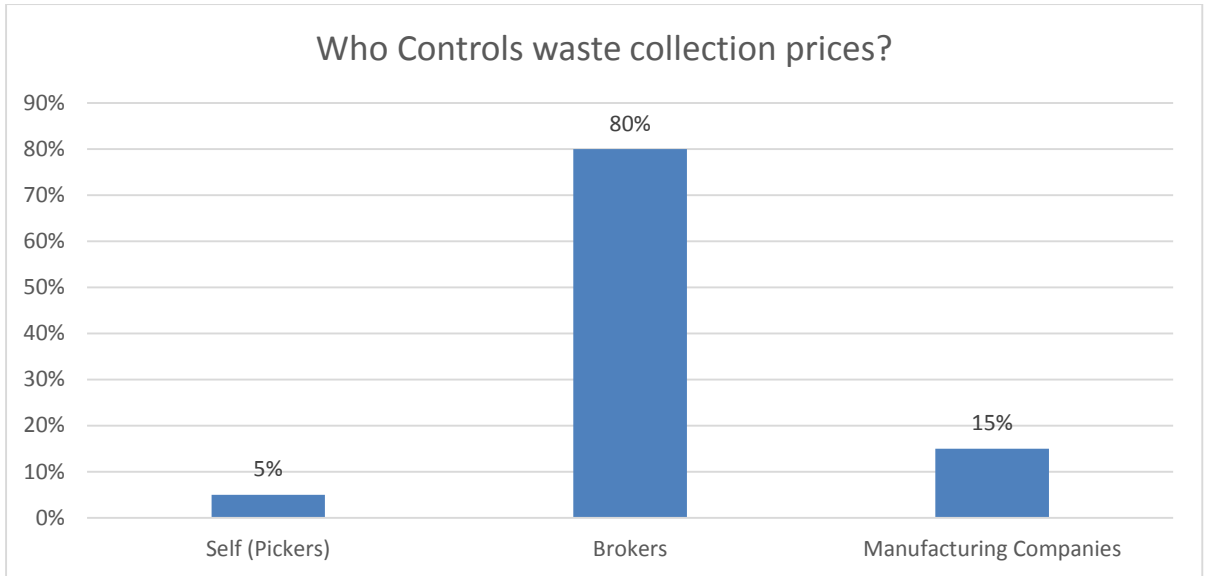
**Figure 5: Solid Waste Segregation**

#### **4.2.6 Revenue of Collected Waste**

The researcher found that the price set for the collected waste is mostly done by the brokers and a relatively fair control from the manufacturing companies and very

little control coming from the waste pickers themselves. About 80% of the participants agreed that prices are controlled by brokers, 15% claimed that it is controlled by the manufacturing companies, and 5% claimed that these prices are controlled by the waste pickers themselves. Such an aspect narrates that there is a chain of waste collection and delivery until it reaches its final destination and the waste pickers play a minor role in influencing the prices of the waste. Brokers on the other hand play a vital role in influencing the prices. The findings on this aspect are in line with the study by Wilson *et al.* 2006 done on the influence of informal waste management sector in developing countries like India which found that brokers within the sector influence the prices of solid waste collected and delivered in the recycling units. These findings could lead to the argument that the waste pickers are a disadvantaged group in the chain of waste collection especially in Kenya.

The above aspect is brought by the fact waste pickers have low education levels and have no other option in terms of income source. Therefore, they just accept what is offered (Wilson *et al* 2006). The manufacturing companies have little influence still because they rely on the brokers to get the waste in large quantities. Moreover, the waste pickers themselves cannot sell their segregated waste directly to the industries because it is assumed most of these collectors do not have the bargaining power when it comes to recycling. Brokers are like pooling centers of waste, which can be relied on by the manufacturing firms when it comes to quantity and flow. Such an aspect leaves the brokers at a very strategic position to control the whole process even the pricing itself.



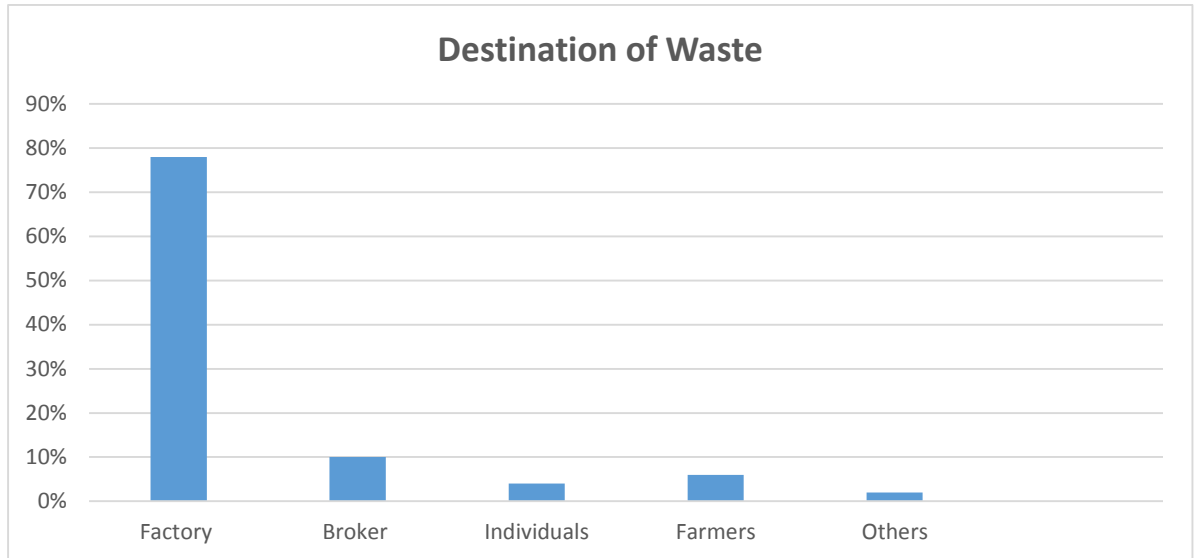
**Figure 6: Who determines the selling price of solid waste**

#### **4.2.7 Destination of solid waste after sale**

The researcher sought to determine the destination of the collected waste after it is sold to the brokers. Through a key informant response, most of the waste collected from the waste collectors is sold to the brokers and later the broker delivers to the various factories and only organic waste is taken to the farmers. Individuals include privately owned waste management units while others include waste management units initiated by NGOs to support communities in managing waste. The waste pickers keep the clothes for their own use since there aren't facilities in Kenya to recycle clothes.

A study by Nzeadibe (2015) asserted that, the value and expected use of solid waste collected in the informal sector determines its destination after being collected. For instance, many of the developing countries lack the right recycling machinery that can accommodate some of the wastes collected. Additionally, the state in which the waste is collected determines the cost in which can be used to modify or recycle it. Therefore, this means that not all the wastes collected is received by the factories either because it is costly to recycle or it does not fit the standards. Organic waste is readily

acceptable in the agricultural sector by farmers because it is used in boosting the fertility the soil. The organic waste does not even need special attention or modification for it to be useful.



**Figure 7: Key Informant Response on solid waste destination**

#### **4.2.8 Collecting wastes for Individual Companies**

The researcher sought to determine if the informal waste pickers are approached by individual companies to collect waste for them or they do it themselves. 8% of the participants claimed that they are requested by the waste recycling companies to collect waste on their behalf. 92% of the participants collect the waste for themselves without any request or guidance from the recycling companies. If this phenomenon can be explained from the SLA theoretical perspective, then there are several aspects that can be drawn. For instance, informal waste collectors embrace this as a source of income for their sustenance. This demonstrates that, it becomes a personal responsibility of the waste picker to carry out the waste collection without any influence from the manufacturing companies. However, this can be explained by the fact that these waste pickers do not deal directly with the recycling companies. For the few waste pickers

who seem to get some influence from the recycling manufacturing companies may have a high chance of dealing with the companies directly.

The study was in line with the existing research by Wachukwu, Mbata, and Nyenke (2010) which asserts that waste pickers occupy the lowest level in the hierarchy and are most vulnerable to low income since they tend to lack well-organized supporting networks. Also, the informal waste collectors do not have financial capacity to possess storage or processing materials and equipment making them easily stand a chance of being exploited. However, the existence of family-organized activities within the dumpsites tend to provide economic and social support to the informal waste collectors perhaps to reduce the chances of being exploited.



**Figure 8: Influence of companies on waste pickers**

#### **4.2.9 Tools and Equipment used by Waste pickers**

The researcher sought to determine the type of tools or equipment that the informal waste pickers use in their daily activities. About 80% of the study participants agreed that they use bare hands when collecting the waste, 8% reported to use sticks,

5% reported to use magnets, and 7% reported that they used gloves. Such an aspect tells that the informal waste pickers lack sufficient equipment to support their daily activities. Collecting waste with bare hands is a clear indication of the potential dangers regarding illnesses that these people face. According to Mothiba (2010), a study in South Africa on informal waste collection classified this as an informal employment and the government does not play its central role in supporting the waste pickers. However other local government such as Brazilian government incorporate the informal waste pickers into their strategic plans for waste collection and make them part of the operational waste collection system

The study added that the government focuses on the municipal level of waste collection which is carried by the regulatory authorities. However, the key challenge is waste goes uncollected thus exposing residents to health hazards. Waste pickers come in handy to collect and segregate the waste thus a key role in waste management. Key challenges that Mothiba (2010) cites include poor financial resources and equipment which cannot even be extended to the informal waste pickers. Still, the author cites that engaging the informal waste pickers in the whole exercise of solid waste management would subject them to better working conditions and providing them with the required equipment.





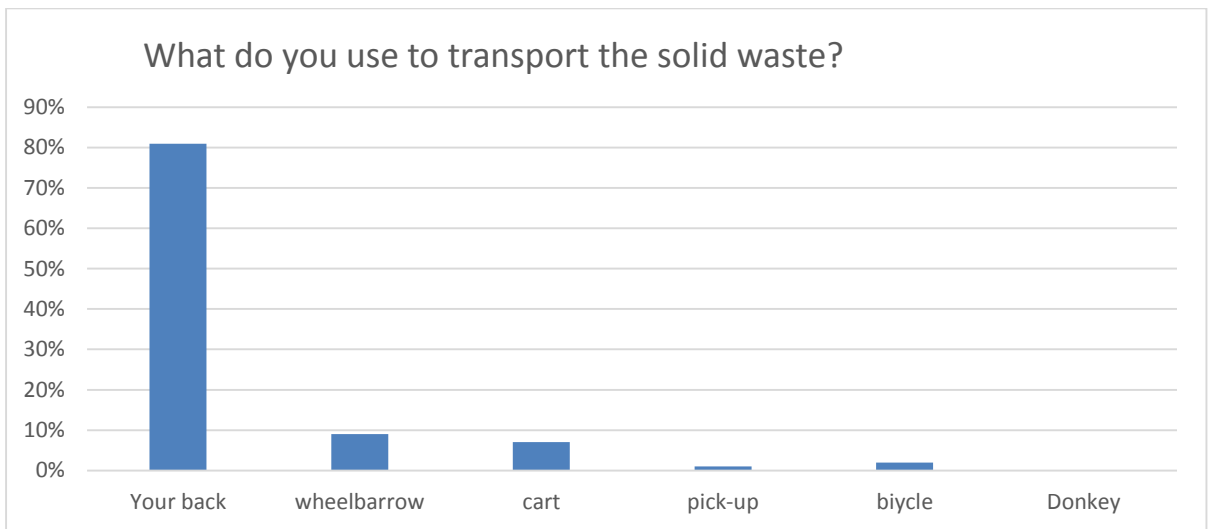
## **Figure 9: Tools used in collecting waste**

### **4.2.10 Mode of transporting solid waste**

After picking waste from different sources, 81% of the participants claimed that they transported the waste on their back. 9% claimed that they used wheelbarrows, 7% claimed that they use a cart, 2% reported to have been using bicycles and 1% used a pick-up. It is clear that a high number of the informal waste pickers rely on their backs to carry the waste they have collected, this sends a signal on some of the challenges that they face. In addition, it also clarifies the platform the sector affords them. Carrying solid waste on their back indicates that the waste pickers prefer it due to the unavailability of logistic machinery.

Several participants claimed that they preferred such means because it is easier to access some of the streets where vans, bicycles, carts and other transportation vessels cannot enter. The study was in line with the existing research by Wilson *et al.* (2006) which cited some of the major problems that informal waste pickers go through. Lack of waste collection equipment is a major challenge. Some waste collectors go for long

in search of solid waste with already collected waste on their back. Rarely, a few of them use equipment such as carts or bicycles which may be expensive to purchase.



**Figure 10: Modes of transporting the collected solid waste**

#### 4.2.11 Weighing of the collected Solid Waste

Weighing the waste collected by these waste collectors is normally done through weight-based or volume-based approach. 58% of the study participants reported that the waste that they collected is weighed through weight-based approach, while 42% asserted that the waste that they collect is weighed through volume-based approach. The volume-based approach assesses the quantity of the waste through a standard volume such as waste put in a particular sack. Weight-based approach connotes that weight is measured using a standard gauge such as digital weighing scale.

Accordingly, waste comes in all types as seen earlier. Such an aspect indicates that; some waste is easily measurable in terms of volume such as plastic carrier bags while others such as scrap metals and plastic containers are easily measurable using the standard weighing scale. Research by Hayami, Dikshit, and Mishra(2006) reported that, determining weight of waste collected in the informal sector was majorly done through rough estimates just by the look – which was more subjective. Volume-based assessment and estimates by the look are not effective measures as they are subjected

to huge errors when it comes to assessing the price for the waste. Hayami *et al.* (2006) recommended the use digital weighing scales to determine the net worth of these wastes regardless of their type.

### **4.3 Socio-Economic Issues of Informal waste picking**

The researcher sought to assess the socio-economic issues that surround informal waste collection to better understand their role and the position that they afford this informal sector. The survey data revealed that on average most of the waste pickers started picking waste as early as the age of 8 years while others started when they were in class six. Majority (84%) cited that they were pushed by poverty which led them into the streets. Such an aspect signals how poverty in a country can shape the social lives of the disadvantaged populations such as the illiterate people.

Hayami *et al.* (2006), through a study conducted in Delhi, noted that poverty in the developing countries has forced people as young as the age of less than 10 years into the streets to secure income. Some of the salient challenges include unemployment, lack of proper diet, poor parental care, homelessness and high chances of illnesses. Tentatively, this tells that this is a vulnerable social group within the developing countries. Additionally, due to their social status most of these people are discriminated and usually given derogatory names like chokora (meaning one who scavenges).

Further, in the developing countries informal waste collection is associated with the illiterate people who engage in different crimes such as theft to sustain themselves.

A key aspects that has led to a serial of other issues such as harassment (Hayami *et al.* 2006). Notably, some issues related to stereotypes towards informal waste pickers were cited by several participants in this study. For instance, most of the challenges that were cited included harassment by the city council, the police and discrimination by residents. Paying close attention to the Kenyan case, most of the informal waste pickers are dirty, ill-educated and are associated with mental illnesses which separates them from other residents.

Most of the informal waste collectors in Kenya are perceived as ‘chokoras’, people who are dirty, deserted, and homeless who rely on the dumpsites or streets as their home. Another characteristic that describes the chokoras is that they are ever sniffing glue which is a drug which makes them appear dangerous. With such social status the waste collectors are discriminated by the normal residents within the streets.

All the respondents claimed that they do not have an association or organization in their waste collection activities. Additionally, 50% claimed that they would like to have such associations in the waste collection. After questioning the rationale for such organizations and associations, majority of the participants claimed that they would assist in bargaining for the waste prices and set standards in this sector which can lead to restructures which can benefit the waste pickers and not exploit them. A key informant reported that”

*“Having an informal association would assist the waste collecting individuals in the streets have a collective bargaining from the exploitation of the brokers at the reception and terminal of the solid waste”*

The study findings were in line with the existing research by Longe *et al.* (2009) which focused on exploring the poverty among the informal waste pickers. The study claimed that, the waste pickers within the informal sector are one of the poor

populations and this tells that they are vulnerable to illnesses which may result from the contamination of wastes they interact with on a daily basis. Additionally, they stand a high chance to be exploited, especially by the brokers as they are ill-educated. Therefore, having an association which can protect their rights would protect them duly.

The daily routine for most of the informal waste pickers is characterized by three major events: waking up, going to waste collection sites, and presenting it to the brokers. An exploratory question assessed how their daily experience and majority claimed that they access a meal or two in day. About 20% reported that they secured three meals however, this was seasonal not a daily routine. All the participants reported that their income was insufficient to afford them a meal for every day despite the hard task that they do. Additionally, 50% of participants claimed that the income that they secure is relied upon by their siblings and family members whom they support. The findings are clearly indicating that the informal waste pickers in Kenya are perceived as unfit for the society due to their vulnerability and weak social status.

Many scholars in this field including the above mentioned have come up with similar findings relating the challenges that the waste pickers go through. In most developing countries such as in Africa most waste pickers suffer from harassment and poor recognition which taint their picture within the public domain. Health issues and injuries are common as these people are exposed to extreme weather conditions especially the ones that are homeless, or working for long hours in unsecure areas. The type of waste they handle such as scrap metal and glass expose them to injuries. Weather conditions, especially during the cold seasons, the waste pickers are exposed to high chances of common flu and cold. It is clear that the waste pickers are less-advantaged group within the society especially for the developing countries.

#### **4.4 Governance Structure of Solid Waste Collection**

The study assessed the governance structure of the solid waste sector. The scope of this research thesis was to identify the linear procedure that affords the waste collection up to the final destination especially in the factories. Most of the aspects featured in this objective were laws and regulations and involvement of the relevant authorities in regulating informal waste management<sup>29</sup>. Approximately 80% of the participants reported that they were unaware of existing regulations within the county level that govern informal solid waste management. The participants claimed that they have their own rules that regulate the activities. A common rule (translated in English) that was reported was, *“Do not collect what someone else has segregated.”* Such a rule tells that the waste collectors are bound by some ethics in their work because it tells them not to go collecting whatever others have collected and segregated for their personal gains.

On a different note, all the participants claimed that they were not licensed to collect solid waste and they were not recognized by the county government for their work. Also, none of the participants were involved in any form of waste collection and management training since they started working on this sector. Still, more than half of the participants reported that there are some materials that they are restricted from collecting such as copper which are used in electrical connections. With previous incidences of vandalism of copper wires and aluminium cables being found with these

items may lead to waste pickers being arrested with suspicion of vandalism. However, brokers inform waste pickerson what to collect and what not to collect.

The recommendations from the participants were; to create small recycling factories which would employ the waste pickers, get rid of brokers, government to start a remuneration programs to support the waste collectors and free training programs on waste collection. A study by Sembiring and Nitivattananon (2008) focused on inclusion of the informal waste segregators into the formal waste management sector which is regulated by the county or municipal environmental authorities. The study concluded that including the informal waste pickers would increase the waste collection activities and more solid waste will find its way to the required destinations. Further, having training programs for waste management for the informal waste pickers would add value to them while compensating them would attract more waste pickers who would make the environment clean. Money is akey incentive here as it would motivate more people interested in this job but they cannot afford to take the small prices offered by the brokers.

## CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Introduction

This chapter presents the major conclusions from the study based on the findings as related to the study objectives. Also, the chapter presents the policy implications of the study findings and recommendations which can be adopted for future change within the solid waste management sector. The recommendations are grouped based on their potentiality of implementation.

### 5.2 Conclusions

The research hypothesis was not approved. Ideally, the research hypothesized that “*The waste pickers have no significant contribution/role in the sorting of solid waste in residential areas of Roysambu Constituency.*” The research shows that these informal waste pickers play a great role in picking random waste disposed indiscriminately within Roysambu neighborhoods and take it to the middle men who avail them to the recycling mini-industries. They are organized among themselves and distributed across several dumpsites within the region and they are actively engaged in picking different sorts of solid waste, separate it, and take it to identifiable middle men for recycling. Collecting more than 200 kilograms of plastic waste in a week for a single individual (based on the study findings) gives a headshot that these groups play a vital role in the environmental waste management – despite the fact that they are not legally recognized.

Scavengers have no other jobs and it is seen to be hard for them to be engaged in the formal job sector – due to their low levels of education. Still, when it comes to the lineage of solid waste collection, the scavengers receive little income with huge benefits going to the middle men and the mini-industries that recycle the waste into other useful goods that find their way into the market.



It is clear that the informal waste management sector appears to be ignored – and there are no formal policies within the constituency that govern the scavenging activities. Mostly, the waste collection activities recognized by the county government do not include the informal waste pickers and this exclusion has denied them several things; starting with poor financial protection from exploitation from the middle men. Also, with the absence of laws regulating informal waste management, the scavengers have adopted their own “informal rules” that guide them in their daily activities of waste picking and separation.

Waste pickers are sidelined and neglected legally and socially. The study unearths the wide array of social and economic challenges that these group of waste pickers go through – harsh living conditions, poor and unhealthy diets, financial problems to meet their illnesses, vulnerability to airborne and skin diseases, and financial exploitation by the middle men that stand in the lineage of waste collection and recycling. Still, these informal waste pickers are nicknamed chokoras and they are stigmatized for their low social life profile – they are even accused of being potential of causing harm and engaging in criminal activities. Sniffing glue is a common activity for these people to keep them active for long hours and persist the harsh conditions in the areas where they get their wastes. Consequently, this makes them being portrayed as harmful group of individuals – regardless of their hard work.

### **5.3 Recommendations**

#### **5.3.1 Short-term Recommendations**

The study findings reveal that the informal waste collection activities are a source of income for some of the disadvantaged population in the developing countries. Therefore, the government can come up with a waste management model that includes

the informal waste sector. One key recommendation can be borrowing from Peru where a National solid plan with a social perspective was implemented. Waste collectors are given uniforms and badges which they use to identify themselves as the collect solid waste from household to household. As much as the waste collectors engage in undocumented activities, they have a positive externality to the environment. They help reduce solid waste around the streets which the municipal environmental authorities do not afford to collect. The county governments have the role of handling waste management but in urban areas such as Nairobi, solid waste management is ineffective as characterized by the escalated indiscriminate solid waste dumping along the streets. This tells that the rules and regulations of dumping are ineffective within the city. Therefore, the county government need to consider inclusion of the informal waste would engage them in a continued exercise which would clear solid waste as these waste pickers have been identified to play a critical role in keeping the environment clean despite the fact that they are rewarded for it.

The study does not imply that the misery social conditions that surround the waste collectors should be encouraged. Rather, the government should implement several waste management programs that foresee the fate of waste pickers in terms of living conditions and their survival. Improving their standards of living could enhance their motivation and more waste would be cleared towards better sustainability of the city. Waste collectors suffer from deprivation of basic needs. In the short-term a compensatory program by the government is worth rewarding the efforts of these waste collectors – and this will be an extrinsic motivation which not only will attract more waste collectors, it will also enhance the efficiency of waste collection. Through such a scheme the county government needs to do some survey on the number of informal waste pickers in the region and inform the national government. Through such

compensation, these individuals can cater for some of their basic needs before taking the exercise at the national level.

### **5.3.2 Medium-term recommendations**

The non-governmental organizations can also consider supporting the waste pickers especially with food and water, personal hygiene, clothes, and shelter. Such appreciative efforts would motivate these waste pickers and improved their standards of living. The government can also introduce more buy-back centers which are controlled by the government officials to expand the opportunity base of the waste pickers. The buy-back centers would be modified to accept a wide variety of wastes while diverting more waste from the landfill sites. Such an approach would enhance recycling activities, and income for these people. Further, implementing a training program of waste handling and management by these waste collectors. Such a program would increase their knowledge on waste separation and the necessity to wear protective equipment. Social security programs, some retirement benefits for elderly people, and access to education for their kids would enhance recognition of their activities. A good example of training program was initiated in Kasarani Constituency where more than 10,000 informal waste collectors who rely on the Dandora Dumpsite as their source of living were enrolled to a Community Based Organization program that built 84 permanent houses for these individuals – with provision of formal education on waste management. Such an initiative can also be adopted in Roysambu and other constituencies to take care of the health conditions of the waste pickers and improve their knowledge on waste management, hence sustainable living.

### **5.3.3 Long-term recommendations**

One of the long-term recommendations that can be achieved in this waste management sector is constitutional amendment to make it a law that informal waste

picking is part of the community based activities that are recognized by the law – and it will legally be formal. Such an aspect translates to the idea that these groups would be officiated to be registered or form Saccos that would streamline waste picking activities. Further, on top-of the buyback centers suggested above, expansion of the industrial area capacity to absorb all types of wastes collected would make it easier, considerable, and economical for the waste pickers to collect all sorts of waste and not only plastics. On top of this, the government has to restructure and renovate the drainage system within the country especially on the urban areas to decongest some of the dumpy sites in the residential areas. This is part of national infrastructure that can take time since the government relies on national budget in which the cash is outsourced from taxes as revenues – therefore, it needs a proper planning on how to accommodate such changes. Lastly, an educational change is worth implementing – incorporating compulsory classes or course related to waste management in all the elementary, primary, secondary, and advanced institutions – as it will develop personal knowledge on the necessity and approaches of waste management at an individual level – and this can be a breakthrough in eradication of the massive wastes that come from residential consumption activities.

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## APPENDICES

### Appendix I: Semi-Structured Interview Questions

#### PART A: DEMOGRAPHIC DATA

1. What is your age in years?
2. Gender – Male  Female
3. Marriage status - Married  Single  Widowed
4. What is the highest level of education you have attained?  
Primary  Secondary  College  University degree
5. Where do you live? Click or tap here to enter text.
6. Location and type of accommodation? Click or tap here to enter text.

#### PART B: SOURCES, COMPONENTS AND SEGRAGATION OF SOLID WASTE

1. What kind of solid waste do you handle?

Type	Tick where appropriate(√)
Organics	
Plastic bottles /containers	
Plastic bags/trash bags	
Paper (Old newspapers, carton brown paper	
Glass	
Scrap metal	
Clothes	
Aluminum	
Bones	
copper	
Electronics	
Old tyres /rubber	

2. Where does the solid waste you collect and segregate come from?

Source	Tick appropriately (√)
Households	
Streets	
Businesses	
Farmers Market	
Schools	
Others	

3. Please consider the table below and approximate quantities (Kg) of solid waste types generated from each source of the listed sources

*(Researcher: You may consider to use the ranking method to assess the most important generator of the specific solid waste)*

Type	Households	Streets	Market	Businesses	Schools
Organics					
Plastic containers					
Plastic bags/trash bags					
Paper					
Glass					
Scrap metal					
Clothes					
Whole plastic bottles					
Aluminum					
Bones					
Copper					
Old tyres/rubber					

4. On average what quantity of waste you collect on a daily basis on average.

Type	Quantity in Kilograms (√)
Organics	
Plastic containers	
Plastic bags/trash bags	
Paper & Old newspapers	
Glass	
Scrap iron	
Clothes	
Aluminum	
Bones	
copper	
Electronics	
Old tyres/rubber	

5. Do you segregate the solid waste you collect?

Yes

No

6. What is your most preferable item to segregate and why?

.....

7. Who controls the selling prices of the solid waste that you collect?

Self (pickers)

Brokers

Manufacturing companies

Others (please specify)

8. Do you collect waste from one locality to another or focus on a specific locality?

.....

**PART C: THE END POINT OF SOLID WASTE AFTER COLLECTION AND SEGREGATION.**

1. In what condition do you collect the solid waste?

Type	Original	Crashed	Decayed	Clear	Dried
Organics					
Plastic containers					
Plastic bags/trash bags					
Paper					
Glass					
Scrap metal					
Clothes					
Whole plastic bottles					
Aluminum					
Bones					
Copper					
Old tyres/rubber					

2. Where do you take (sell) the segregated waste? (Disposal of the solid waste)

Type	Factory	Broker	Individuals	Farmers	Others
Organics					
Plastic containers					
Plastic bags/trash bags					
Paper					
Glass					
Scrap iron					
Clothes					
Whole plastic bottles					
Aluminum					
Bones					
Copper					
Old tyres/rubber					

3. What are the common methods of solid waste disposal you have seen people use?

Method of disposal	Tick where appropriate(√)
Garbage collecting companies	
Littering	
Mali kwa mali	
Public dustbins	
Burning	

4. Do companies approach you to collect solid waste associated with products they produce?

Yes

No

5. If yes in quiz 4 above, please name some of these companies

6. If yes in quiz 4 above, do you have a written agreement with the company?

Yes  No

7. What tools/ equipment do you use to collect the solid waste?

Gloves

Bare hands

Sticks

Magnets

8. What do you use to transport the solid waste?

Your back

Wheel barrow

Cart

Pickup

Bicycle

Donkey

9. What method do you use to weigh the solid waste that you segregate?

Volume based

Weight based



**PART D: TO INVESTIGATE THE SOCIO-ECONOMIC ISSUES OF  
SCAVENGING ACTIVITIES**

1. When did you start waste picking?

.....

...

2. For how long have you been picking waste?

.....

.....

3. What pushed/ motivated you into waste picking?

.....

.....

4. Share with me the challenges you encounter during your daily routine as regards  
solid waste collection and segregation?

.....

.....

5. Do you have an association or organization of waste pickers? Yes  No

If yes, how is the association organized?

.....

.....

6. If no association of waste pickers exists, would you like to have one?

How would you like it organized? .....

7. Describe your daily routine?

.....

.....

8. Do you normally secure three meals in a day?

.....

.....

9. Share with me how you feel about your income? Is it satisfactory to meet your needs?

.....

.....

10. Share with me how you would rate your relationship with people who are outside this sector?

.....

.....

11. Do you have group leaders?

.....

.....

12. What would you say is the benefit of the work you do towards the environment?

.....

.....

13. How do Kenyans perceive you as waste pickers? What is their attitude towards the work you do?

14. Do you wear any protective gears (boots, aprons, gloves, shade etc.) when collecting and segregating the solid waste?

Yes  No

15. If yes what gears do you have?

16. If

no,

why?

.....

.....

**PART E: GOVERNANCE STRUCTURE**

1. Are you aware of any laws and regulations that guide solid waste management in Kenya/Nairobi?

.....  
.....

2. What rules do you adhere to when scavenging?

.....  
.....

Are you licensed to collect solid waste?

3. Does the County government recognise the work you do?

.....  
.....

4. Have you ever been involved by the county government/ NEMA in trainings on waste management? Yes  No

5. If yes what kind of training (please specify)

6. Does the county government involve you in any decision making? Yes  No

.....  
.....

7. Are there items that you are banned from collecting?

.....  
.....

8. If yes, what are these items?( please specify)

.....  
.....

9. What do you think the government can do to assist in scavenging/solid waste management?

.....  
.....

10. Is there any hierarchical procedure you normally follow in scavenging process and submission of waste?

.....  
.....

11. Based on your experience with the current governance, are there some aspects you like to be changed? Given the governance mandate, what can you change and why?

.....  
.....

## Appendix II: Key Informants Interviews

1. How many tonnes of waste do you receive in a day?

2. What is the composition of waste you receive?

Type	Tick where appropriate(√)
Organics	
Plastic bottles /containers	
Plastic bags/trash bags	
Paper (Old newspapers, carton brown paper	
Glass	
Scrap metal	
Clothes	
Aluminum	
Bones	
copper	
Electronics	
Old tyres /rubber	

3. What type of waste are the waste pickers interested in?

4. Do you have any segregation initiatives in Nairobi?

Yes

No

5. If yes in quiz 4, is there awareness created and how?

6. What are the major challenges that you encounter in this venture???

7. What are some of the opportunities as regard solid waste management?

8. What are the policies/laws (if any) that govern solid waste management that you know of?

9. What are the challenges/opportunities you can identify with solid waste management legislation?

**Solid Waste Transfer Station Operator/Owner**

1. What type of waste do you receive?

Type	Tick where appropriate(√)
Organics	
Plastic bottles /containers	
Plastic bags/trash bags	
Paper (Old newspapers, carton brown paper)	
Glass	
Scrap metal	
Clothes	
Aluminum	
Bones	
copper	
Electronics	
Old tyres /rubber	



2. Where do you take the waste after accumulating it?

Type	Factory	Broker	Individuals	Farmers	Others
Organics					
Plastic containers					
Plastic bags/trash bags					
Paper					
Glass					
Scrap iron					
Clothes					
Whole plastic bottles					
Aluminum					
Bones					
Copper					
Old tyres/rubber					

## Supervisor of Recycling Facility

1. What is the tonnage of solid waste you receive?

Type	Price per Kilo (Ksh.)
Organics	
Plastic containers	
Plastic bags/trash bags	
Paper & Old newspapers	
Glass	
Scrap iron	
Clothes	
Aluminum	
Bones	
copper	
Electronics	
Old tyres/rubber	

2. What are the intervals of receiving this waste?

Annually  Weekly  Monthly  Daily

3. Who brings the waste to your facility?

Waste Picker  Broker  Individuals

4. What are the major challenges that you encounter in this venture???
5. What are the policies/laws (if any) that govern solid waste management that you know of?
6. What are the challenges/opportunities you can identify with solid waste management legislation?

**Socio Development Officer**

1. Before waste pickers began collecting how was the crime rate?
2. Since the waste pickers started collecting has the crime rate gone down?
3. What are the major challenges that you encounter in this venture???
4. What are the policies/laws (if any) that govern solid waste management that you know of?
5. What are the challenges/opportunities you can identify with solid waste management legislation?