INFLUENCE OF INFORMAL SOLID WASTE MANAGEMENT ON LIVELIHOODS OF URBAN SOLID WASTE COLLECTORS: A CASE STUDY OF NAKURU MUNICIPALITY, KENYA

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A Thesis submitted to the Graduate School in partial fulfillment for the requirements of the Masters of Arts Degree in Sociology (Community Development and Project Planning) of Egerton University

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DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been submitted in any University or College for the award of a Degree or Diploma.

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Recommendation

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DEDICATION

This work is dedicated to my beloved daughter

Latasha Njeri Njoroge

ACKNOWLEDGEMENTS

I wish to thank my God who has been my source of strength, courage and inspiration throughout my studies. I also express my sincere thanks and appreciation to the Board of Post Graduate Studies, Egerton University for having accepted to offer me a chance to pursue my postgraduate studies and more sincerely express my gratitude to my employer for giving me time off and providing financial support to enable me pursue this course. Special thanks to Dr. M. Theuri, Dean Faculty of Arts and Social Science for his continuous encouragement in and out of class. My appreciation goes to Dr. E. Bor, Dr J. Kimani, Mr. R. Kisaka, Ms B. Onsarigo and Ms H. Murenga for their valued input in my proposal and their fervent encouragement. I am also particularly grateful to Prof. S. Ngari and the Faculty of Science Dean's office staff members for their moral support and their commitment to share my workload during my absence. I am highly indebted to my supervisors Dr. S. Wokabi and Dr. K. Ng'etich for their guidance, professional supervision, inspiration and unlimited moral and material support provided in the course of this exciting research work. My special thanks go to all the respondents in Nakuru Municipality who provided the information that has formed the basis of this thesis. Finally, I wish to appreciate my student colleagues (S. Kinyua, K. Nyamolo, C. Nyakinda, G. Ogeto and L. Kang'ata) for their encouragement and shared ideas.

God bless you all abundantly

ABSTRACT

This study focused on how the urban waste collectors in Nakuru municipality earn their livelihood through turning waste into wealth by deriving income from solid waste. Reducing poverty is a growing task for households, governments and development agencies in urban areas. This has been compounded by the rural-urban migration, industrialization and the globalisation of the urban economies with the resulting structural adjustment policies and retrenchment, which have left the young generation with little hope of formal employment. Nakuru town has witnessed a proliferation of informal income generating activities which include solid waste management, which are absorbing the high population of the unemployed people. Despite being faced with major difficulties like working in deleterious conditions, solid waste management is among the essential housekeeping service required by urban dwellers to maintain their quality of life. The objective of this study was to examine how solid waste management contributes to the livelihoods of the waste collectors. The study used an integrated modified theoretical framework of the DFID and UNDP, which emphasises on the assets available to the waste collectors and how these assets can be utilised for sustainability of livelihoods. The research design was a case study design where data was collected using the interview schedule which was supplemented by secondary and other primary sources of information. The unit of analysis was the waste collector in solid waste management drawn from the informal sector where 192 respondents were identified using the snow ball sampling technique and interviewed. Data was analysed using both the descriptive and inferential statistics. The Statistical Package for the Social Scientist (SPSS) was used to compute the statistics. The study found that the waste collectors earn an income from recycling, reuse and composting of solid waste which contributes to their livelihoods. The study also established that these livelihoods are earned in occupational conditions that are unsafe and injurious to the waste collectors. The study recommends that the informal sector be recognised as stakeholders within the municipality in solid waste management and since the sector is concerned with attainment of livelihoods, the occupational health hazards should be minimised by the Nakuru municipal Council advocating for adherence to safety precautions.

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LIST OF ABBREVIATIONS

CBD	:	Community Based Organizations
DFID	:	Department for International Development
JICA	:	Japan International Cooperation Agency
MCN	:	Municipal Council of Nakuru
MEWAREMA:		Menengai Waste Recycling Management
MSWM	:	Municipal Solid waste Management.
NAWACOM	:	Nakuru Waste Collectors and Recyclers Management
NEAP	:	National Environmental Action Plan
NEMA	:	National Environment Management Authority
NES	:	National Environmental Secretariat
NGO	:	Non-Governmental Organization
PLMC	:	Plastic Levy Management Committee
SHD	:	Sustainable Human Development
SWM	:	Solid Waste Management
UNCHR	:	United Nation Commission for Human Rights.
UNCHS	:	United Nation Centre for Human Settlement.
UNDP	:	United Nations Development Programme
UNEP	:	United Nations Environmental Programme
WHO	:	World Health Organization

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

This study focused on the impacts of solid waste management on the livelihoods of the individual waste collectors in Nakuru municipality and highlights the conditions under which these livelihoods are attained. The disposal of solid waste is becoming a major public health and environmental concern in urban areas of many developing countries due to the increased rate of urbanization. It is in this context that the management of solid waste is one of the most important services that provide employment to many urban households, to maintain and improve the quality of their life. Urban waste management has continued to create a lot of attention to scholars as they observe that too much garbage is lying uncollected in the streets becoming a health risk, environmental pollutant and public nuisance. In Nakuru the problem of solid waste has been recognized as a big threat to the quality of the environment (Mwangi, 2002). However, the municipal authorities charged with the responsibility of providing solid waste management and other services have found it increasingly difficult to play the role of collecting, transporting and disposing waste from their municipal boundaries (UNEP, 2005). Thus in this era of shrinking municipal budgets and increasing urban population the problem has been aggravated by poor legislation and inadequate funds to efficiently facilitate the provision of services.

The migration of people into urban areas in search of jobs has accelerated urbanization in developing countries (Henderson, 2002) which has further impoverished and marginalized the waste collectors. Industrialisation and the resulting rural-urban migration, has resulted in excess pressure on the limited urban infrastructure, which have exacerbated the rate of poverty as exemplified by the ever-increasing number of slums. Reducing poverty in urban areas is a big task for governments in the third World countries, because as poverty increases so do the struggles of vulnerable groups in their effort to eke out a living under conditions that are hostile to their very existence, which include lack of social and economic opportunities. According to Gilbert *et al* (1996) the management of solid waste often seems impossible in most cities of the south. Doan (1998) observes that throughout history cities and towns have struggled with how to collect and dispose off, the refuse generated by their population. Whereas Obirih-Opareh (2002) states that solid waste management has poor cost

recovery and most urban authorities in developing countries have failed to devise effective response mechanisms to mitigate the problem of low cost recovery. In these light Mwangi (2002) notes that in Nakuru municipality the local authority has not efficiently and effectively provided solid waste management services because of an increase in urban population and an influx of informal settlements. Therefore, the task of solid waste collection and disposal is far beyond the cost of municipal governments and the problem is likely to intensify unless alternative means to solving the problem are developed.

In many cities of developing countries, private or public systems of waste management are in adequate, only collecting between 30 to 50 percent of solid wastes and most cities dispose solid waste in ways often detrimental to the environment such as open burning, and or dumping (Hoornweg and Thomas, 1999). Solid waste management is a complex task which depends upon, organisation and cooperation between households, communities, private enterprises and government authorities in providing technical solutions for waste collection, transfer, recycling and disposal.

According to Mwangi (2002), the role of municipal authorities has been changing from one of provider, to one of facilitator and coordinator of different actions by a wide variety of actors in solid waste management. It is therefore important to incorporate the formal and informal sectors in urban waste management, with the paramount aim of maintaining a quality healthy living environment and creating livelihoods for the various waste collectors. According to Allison, *et al* (1998) and Kundu (2002) an effective waste management even when carried out informally can be an important facet of environmental protection and conservation.

Like most cities, Nakuru is a huge consumer of resources, and a prodigious producer of waste. According to Raini (2009), each day the town generates an estimated 240 tonnes of domestic solid waste, while the commercial sector generates 2400 tons/day. Only about 60% of this is collected and disposed off to approved dumping sites, the rest accumulates in the environment and is eventually deposited into the lake by storm water and wind. Pre-treatment of industrial waste is the exception rather than the rule, and storm water is discharged into the lake without prior treatment. Karanja (2009), states that lack of effective solid waste management has made Nakuru lose its erstwhile accolade of the 'cleanest town' in East Africa. The town, once reputed as a model in garbage collection, is reeling in filth. Garbage

collection has largely been left to youth groups. With residents paying between Ksh. 200 to Ksh. 300 a month for garbage collection, but residents claims that these services are unreliable. The residents accuse the Nakuru Municipal Council of failing to monitor how the private organisations carry out their duty since most garbage usually ends back on the streets because the groups do not have adequate facilities to carry out the waste management activities.

The council has a few ageing refuse collection trucks, which can no longer be relied upon to manage collection. Ironically, though it is supposed to ensure the town is clean, the council is said to be a major polluter of Lake Nakuru through its dumpsite. Hundreds of tonnes of solid waste at the council's Gioto dumping site on the foot of Menengai Hills are washed by flood during rains, ending up in the lake.

1.2 Statement of the Problem

The resource strapped municipal governments, the civil society, the Non Governmental Organizations (NGOs) and the Community Based Organizations (CBOs) are in no position to adequately dispose the ever-increasing heaps of garbage from the streets, households and or neighbourhoods to their designated sites, therefore posing greater health risks in the environment. The rapid population growth in Nakuru municipality as a result of natural growth, the expansion of municipal boundaries and rural-urban migration has led to the growth of the informal solid waste collection. However, the role played by the informal waste collector in solid waste management has not been acknowledged. Therefore this study examined how the waste collectors have managed to earn a livelihood from the solid waste in Nakuru municipality considering that they work in conditions that are deleterious to their health.

1.3 Research Objectives

The main objective of this study was to examine the extent into which solid waste management contributes to the livelihood of the urban waste collectors.

The specific objectives of the study were: -

1. To ascertain the income generated from solid waste management and how it has been used to improve on the livelihoods of the waste collectors.
2. To assess the occupational health hazards and risks associated with solid waste management.

3. To highlight the strategies used by waste collectors in Nakuru Municipality and what they are doing to reduce municipal waste.
4. To evaluate the vulnerability context of the urban waste collectors and the capitals available to them.

1.4 Research Questions

In order to realise the above objectives this study was guided by the following questions.

1. Which economic and social benefits have the waste collectors derived from solid waste management and how has it helped in improving their livelihoods?
2. What are the occupational health hazards and risks associated with solid waste management?
3. What specific strategies do the waste collectors use in solid waste management and how have these strategies contributed in reducing solid waste in Nakuru municipality?
4. How vulnerable are the waste collectors and what stocks of assets are available to them?

1.5 Research Assumptions

The study made the following assumptions: -

1. That solid waste management economically and socially benefits the waste collectors involved.
2. That the waste collectors work and live in conditions that put their health at risk.
3. That the waste collectors use various strategies of solid waste management, which have contributed in reducing solid waste in Nakuru municipality.
4. That the waste collectors are vulnerable and lack enough stocks of assets to overcome their vulnerability.

1.6 Justification of the Study

Nakuru town has experienced a rapid population growth in the last decade with a population of 350,000 people (Mwangi, 2001) which has resulted from natural growth, rural urban migration, especially after the tribal clashes in the neighbouring areas like Molo and Likia , and lastly as a consequence of extension of municipal boundaries. As a result the once renowned "cleanest town" in East Africa, according to Mwangi (2000), no longer has this reputation. The Municipal council of Nakuru recognizes the increase in deteriorating

environment and is committed and willing to collaborate with community groups, Non Governmental Organizations (NGOS) and individuals to address these issues and recover the lost glory. Therefore this study will guide the decision makers in recognizing the role of the waste collectors in solid waste management in Nakuru municipality.

The government of Kenya has currently prioritised solid waste management as a pressing issue and recognises the value and importance of integrating environment and development objectives into decision-making process (UNEP, 2005). This study interrogates the role of the informal sector in solid waste management in the municipality and how they have improved their livelihoods by converting waste into wealth.

Solid waste management in developing countries has received less attention from policy makers and academicians than that paid to other urban environment problems such as air pollution and waste water treatment (Medina, 1997). This study therefore highlights the emerging issues in solid waste management.

Waste management is one major area in urban environment which has a major impact on urban livelihoods and peoples health with disastrous consequences in Africa (Obirih-Opareh, 2002). Therefore this study highlights the occupational health hazards and safety precautions undertaken by the waste collectors in waste management that when enforced will lead to improved livelihoods to both the waste collectors and the urban respondents.

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1.7 Scope and Limitations of the Study

The study covered the waste collectors in solid waste management in the informal sector in Nakuru municipality and their solid waste management strategies. The occupational and living conditions of the actors were also studied. The study did not focus on solid waste management practices from the major industries in the municipality. This is because the industries are striving to meet the environmental impact assessment and environmental auditing as stipulated by the National Environmental Management Authority (NEMA) and would therefore not be undertaking solid waste management for the purpose of improving livelihoods. The study covered all the waste collectors irrespective of their financial background so as to be able to understand their development history and be able to conclude whether they started operating from the point of urban poverty.

Most of the actors in the informal sector involved in solid waste management are not registered with the local authority, which made it difficult to exhaustively study all the actors involved in these sector. This therefore prompted the researcher to undertake a snowball sampling technique for the informal sector.

1.8 Definition of Terms

Economic Instruments: These are instruments of solid waste management that are more flexible and non prescriptive that allows economic agents to dynamically innovate ways of cost-effectively complying with the minimum standards specified (UNEP, 2005).

Hazardous Waste: Is a solid waste with properties that make it dangerous or potentially harmful to individual human health or the environment.

Livelihoods: A livelihood is defined by Carney (1998) as comprising the capabilities, assets, including both material and social resources and activities required for a means of living

Municipal Solid Waste: Refers to the materials discarded in the urban areas for which municipalities are usually held responsible for collection, transport and final disposal (Medina, 1997)

Solid Waste Management: It is the systematic administration of activities that provide for collection, source separation, storage, transportation transfer, processing, treatment and disposal of solid waste (Xerox Corporation, 1998).

Waste collector: In this study is defined as a person, who is either employed or unemployed but is collecting, transporting or disposing solid waste for the purpose of directly generating income.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on the subject of solid waste management and its influence on urban livelihoods. The review discusses the concept of solid waste management, the hierarchy of SWM in Nakuru municipality, urban poverty and environment, livelihoods and poverty studies is also reviewed. The study also re-examines waste management effects on health and the recovery strategies used within the municipality. The chapter also outlines the conceptual framework used in the study to pinpoint the livelihoods assets used in solid waste management, how they have been utilized for sustainability and the vulnerability context.

2.2 Solid Waste Management

Solid waste management means an integrated system of waste generation, gathering, storage, collection, transportation, treatment and disposal (Skinner, 1995). Solid waste management according to Obirih-Opareh (2002) is concerned with how actors get organised for the collection, disposal, (re)use, recycling and composting of solid waste. The aim of any solid waste collection system should be to reduce environmental pollution. An effective waste collection system thus aims to collect as much waste as possible within the given amount of labour, capital and time (Jerie, 2006). The increasing cost of managing solid waste is making it difficult for local authorities in many developing countries to handle the process efficiently and effectively. Post and Mwangi (2006) observe that lack of financial means translate in low levels of competence trust ascribed to the executive arm of the municipality. This increases the complexity of solid waste management in the municipality calling for multiple stakeholders in the solution of the escalating problem which therefore leads to the waste collectors contributing to help solve the problem informally and which lay the basis of undertaking the study of the influence of waste on urban livelihoods.

Cointreau-levine (1994) notes that solid waste receives scant attention at the municipal planning stage yet may account for between 20% and 40% of municipal revenues. This problem is exacerbated by poor cost recovery mechanism initiated by most urban councils, due to citizens unwillingness to pay because as Post and Mwangi (2006) observe that in Nakuru, there is poor delivery of services as a result of unmotivated workers, ghost workers, corruption and embezzlement of public funds. They argue that the Nakuru Municipal

Council, which has both the legislative and the executive arm, should be in a position to provide these essential services, but due to the inability of the Municipal authority the formal and informal sector have taken over. Therefore, the fundamental question is whether the informal sector can be able to achieve what the local authority has not been able to achieve.

Third world countries have experienced rapid urbanization in their cities during the last half of the twentieth century and it is estimated that the urban population will double between 1987 and 2015 (Medina, 1997). Urbanization implies creation of new slums and the expansion of the existing ones, which intensify the pressure on urban infrastructure in these cities, which are already overwhelmed. There exists a positive relationship between a household's income and the amount of wastes generated. The rich households consume more and produce more waste than the low-income households. Globalisation can lead to economic growth, which combined with population growth and urbanization results to strains in municipal resources due to the resultant generated waste. This study focused on the role of the informal sector in minimising waste due to the effects of urbanization.

Images of waste scattered in the streets and waste collectors collecting waste are powerful symbols of urban poverty. Slater and Chasca, (2003) asserts that waste that lies in the streets in informal settlements demonstrates the lack of capacity of governments to provide services. In low-income areas which mostly lack refuse collection, the households dump their waste materials to the nearest vacant plots, public space including roads and even rivers, which might accumulate in the streets and even block rivers. Developing countries need low cost, labour intensive solutions that reduce poverty particularly among the underprivileged members of the society by developing opportunities to create income for the informal sector that form the bulk of the poor. The study therefore examines the contribution of the informal sector in providing low cost labour intensive solutions to solid waste management.

The government has prioritised solid waste management over other environmental issues as can be exemplified by various policies and legislative documents like the National Environmental Action Plan (NEAP) 1994, and the *Sessional Paper Number 6 of 1999* (UNEP, 2005). At the local level, solid waste management has also attracted some attention and in Nakuru municipality, the decision-making on environmental issues is done by the public health and environment committee. Collecting, transporting and disposing of municipal solid waste represent a large expenditure for Third World cities. Waste

management usually accounts for 30-50 percent of municipal operational budgets. Despite these high expenses, cities collect only 50-80 percent of the refuse generated (Medina, 1997). In Nakuru municipality the environment related issues are enhanced through the Public Health Act and despite there being a regulatory body a lot of waste is dumped in open space through out the municipality and nobody is ever held accountable for this waste. The inability of the municipal authorities to collect all the waste that has been generated has created a livelihoods opportunity to the informal waste collectors who have assisted in reducing the waste and thus earning an income from collecting transporting, scavenging and disposal of the waste.

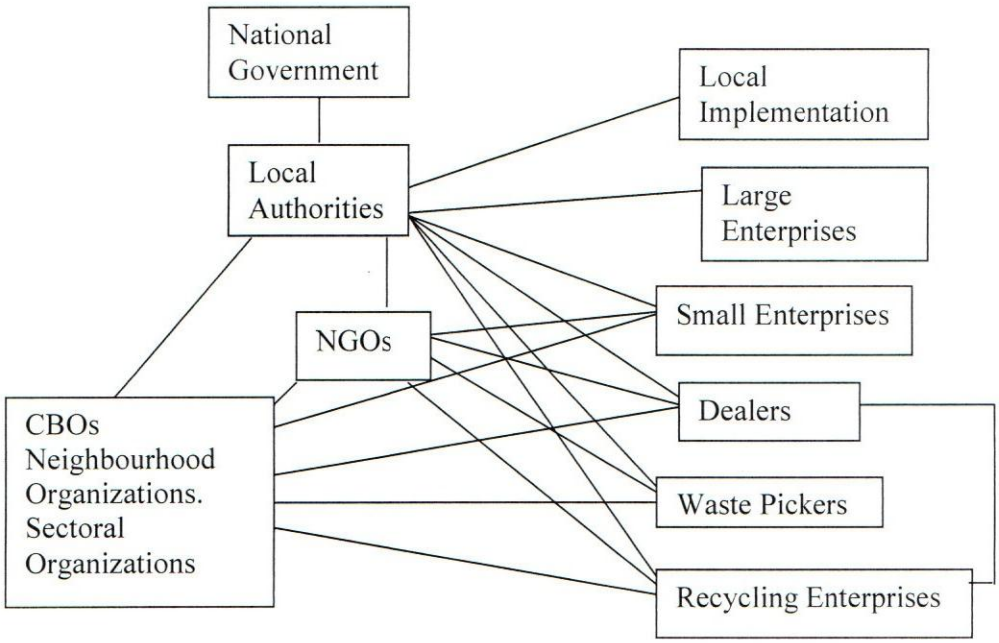
2.3 Hierarchy of Solid Waste Management in Nakuru Municipality

In Nakuru municipality according to Mwangi (2000) the management of solid waste is primarily the responsibility of the municipal council. In recent years private sector have increasingly been involved in refuse collection and disposal, and some areas within the town have access to these services, though they are neither effective nor efficient. The collection of domestic waste is on a house-to-house basis whereas institutions and factories are supposed to be provided with refuse storage facilities. However, there is evidence of uncollected heaps of garbage lying in the streets of Nakuru which becomes the focus of this study as the waste collectors search through these heaps in order to earn livelihoods.

Mwangi (2000) found out that 86% of household waste is dumped on undesignated open sites whereby the municipal council collects 9% with the private sector collecting 5%. The council has one designated dumping site located in an abandoned quarry next to London residential area where the disposal system is by open dumping. The Public Health Department has placed several refuse collection chambers in partnership with various organisations in various residential areas within the municipality. It is important to note that these chambers currently are not in proper use as evidence shows that they are rarely emptied and waste spills over to roads and residential areas thereby spreading the effects of the brown agenda to the urban population. This study is concerned with the health risks and associated occupational hazards which are posed by these waste and how they affect the livelihoods of the waste collectors.

Mwangi (2000) observes that the following groups are involved in solid waste management in Nakuru municipality: the Nakuru Municipal Council Public health Department, Private companies, individual waste paper collectors and scrap metal recyclers, Non governmental

organisations and environmental Community Based Organisations. This study focused its attention to the waste collectors who qualify to be considered as the waste collectors and they include waste collectors in small enterprises, dealer's, waste pickers and recycling enterprises and how it has impacted on their livelihoods. The hierarchy of actors is diagrammatically represented in Figure 2.1.



Source: Baud *et al,* (2001)

Figure 2. 1: Alliances in Urban SWM

The range of actors in urban solid waste practices can be clustered into the following groups according to Baud *et al,* (2001). The public sector which includes the national authorities, local authorities which constitute a central set of players, the second set of actors are the private sector which include the large and small registered enterprises carrying out collection, transport, disposal and recycling. The third sectors are the small scale, non-recognised private sector that include the waste pickers, itinerant buyers, traders in waste materials and non registered small scale enterprises and lastly the local community and its representatives which include the non governmental organisations and the community based organisations. The major concern of this study is with the interrelationship amongst the various actors in the

alliance and how the waste collectors have been able to develop from the alliance and earned a livelihood.

2.4 Urban Poverty and Environment

Urban environment encompasses the interaction of population, growth, city management, the built environment and the natural environment in which the city is located (Bartone, 2000). Urban poverty and environmental conditions are intimately related to each other where the poor are forced by their poverty to live in unsafe marginal and environmentally sensitive sites such as the most polluted landsite near solid waste dumps. The more serious environmental problems at the households and community levels such as inadequate water and sanitation facilities and indoor air pollution are more prevalent in poor cities and poor neighbourhoods. Hence poverty constrains the poor to live in unsafe environment. In turn the poor environmental conditions lead to poor environmental health, which aggravates poverty and leads to impacts such as loss of income owing to sickness and disease (Bartone, 2000) and therefore makes the waste collectors to be vulnerable. This study is concerned with the occupational health hazards of the waste collectors; the study asks pertinent questions on how and where the waste collectors earn their livelihood.

Solesbury (2003) states that solid waste management is a huge part of the economy and there are a plethora of different livelihood activities that make up the waste economy as exemplified by Beall (1997) who found out that in countries where exclusion from formal labour market is the norm rather than the exception, involvement in waste recycling often constitutes the first entry point as well as the last resort for thousands of workers in the informal economy. Moreover Baud (2000) on livelihoods and poverty studies asserts that waste can create employment opportunities, which in turn can reduce poverty. Obirih-Opareh (2002) states that this is inspired by alternative development views that started from people's own initiatives, which have economic potentials and positive impact on the environment. UNCHS (1996) notes that the "waste economy" provides a livelihood for tens of thousands of people living in developing countries. The study focused on solid waste management as a source of income and how it has contributed to the livelihoods of the waste collectors.

The urban management involves the use of an effective, efficient, accountable and entrepreneurial approach to urban development policies (Rakodi and Lloyd, 2002). Dijk (2001) refers to it as efforts to coordinate and integrate public as well as private actions to

tackle the major problems facing the inhabitants of the city, like management of solid waste, to make a competitive, equitable and sustainable city. In this regard the municipal council which rests with the authority of urban management should be faulted for its failure to manage the urban centre and for inequitable and selective waste collection within the municipal area. The city is highly polarised due to the existing inequality and therefore the most affluent people benefit from municipal services (Mwangi, 2000) whereas the waste collectors are not provided with the basic services by the municipal governments and therefore most solid waste management by the formal and informal sector is concentrated in low-income areas. The link between poverty and waste generation thus becomes a point of focus as some areas especially in the affluent regions a lot of waste is generated but the picture of waste thrown in the street is not evident compared to the low class zones where waste is seen scattered all over the streets. Although waste is a class issue, majority of the urban population live in the low class areas and therefore their mass combination of waste generated far much outweigh the mass production of the affluent regions which therefore explains why waste is scattered all over the streets in the domicile of the waste collectors. It is this waste that is left unaccounted for by the municipal authority that provides alternative informal employment for the waste collectors.

2.5 Livelihoods and Poverty

A livelihood is defined by Carney (1998) as comprising the capabilities, assets, including both material and social resources and activities required for a means of living. It is sustainable when it can cope with and recover from stresses and shocks and maintain the assets both now and in the future without undermining the natural resource base.

According to Rakodi and Lloyd (2002) households or individuals are considered poor when the resources they command are insufficient to enable them to consume sufficient goods and services to achieve a reasonable minimum level of welfare and Chambers (1989) argues that deprivation occurs when people are unable to reach a certain level of capability for example physical weakness, isolation, vulnerability and powerlessness in addition to lack of income and assets. The sustainable livelihood approach emerged during the 1987 World Commission on Environment and Development in their document "our common future" as an approach for maintaining or enhancing resource productivity and management and securing ownership and access to resources and income earning activities and ensuring adequate stocks and flows of food and cash to meet the basic needs (Solesbury, 2003).

The Kenya government interim poverty reduction strategy paper 2000-2003 (Republic of Kenya, 2000) in its introduction asserts that the primary development goal for Kenya is to achieve a broad based sustainable improvement in the standards of welfare of all Kenyans. This requires a concerted effort to tackle the high incidence of poverty that afflicts over half the population. The government will spearhead the action incorporating the private sectors, Non Governmental Organizations (NGOs) and Community Based Organizations (CBOs). The government must mobilise all available resources and use them efficiently and effectively in the fight against poverty. In the preface on the Guidelines of the Human rights approach, it stipulates that eradicating poverty must be the first goal in the new millennium (UNCHR, 2000). The Human Development Report 2000 (UNDP, 2000) notes that a decent standard of living, adequate nutrition and decent work are not just development goals they are also human rights. The study examines the precautions that are undertaken by the waste collectors as they eke out a living in solid waste management bearing in mind that there are various risks in working with waste.

Livelihood and poverty based studies according to Baud (2002) seek to improve employment opportunities and reduce poverty for the people working with waste. These studies recognise the economic potential of waste while reducing the negative impact on the environment and according to Obirih-Opareh (2002) they have a link to sustainable development. Problems of waste disposal are more severe in cities of developing countries as it often creates one of the most visible environmental problems since the way waste is handled affects people's lives and the surrounding environment. This study finds out the waste strategies that are employed within the municipality and the effects that they have on people's lives. House to house waste collection is too expensive for many households and according to Slater and Chasca (2003) and Obirih-Opareh (2002) a country's waste management system is a critical indicator of its level of development.

Waste picking as a livelihood activity is seen as a reflection of the inequalities in urban life. It is important to note that the most affluent people of the society live in areas like Milimani, Section 58 and even in the commuter zone areas of the town like Kiamunyi, whereas the poor live in areas like Kwa Rhonda, Bondeni, Free area and Kiratina. According to Medina (1997) the waste generated tends to go up as income increases and low-income areas tend to produce a large percentage of organic materials usually three times higher than that of high-income area. Waste picking offers a survival strategy for some of the most marginalized people in

urban areas without compromising or competing with environmental demands. That is, it can present opportunities to some to lift them out of poverty (Slater and Chasca, 2003). By understanding the livelihoods of the waste collectors in waste management we will be in a position to understand the strategies they are employing to lift themselves out of the quagmire of poverty. Solid waste management is thus associated with job creation as a survival strategy and as an environmental issue especially in the browning agenda where environmental considerations are overriding at the municipal scale. This therefore underscores the paramount environmental contribution undertaken by the waste collectors in minimising the waste scattered in our streets as they earn their livelihood.

2.6 Waste Recovery and Recycling

Waste recycling according to Cointreau and de Kadt (1991) is often undertaken as a survival strategy when the waste collectors are unable to join formal employment, and when non waste resources are scarce or unaffordable. Waste re-use plays a valuable role by recycling materials, further exploitation of scarce natural resources is minimised. But according to Furedy (1992), waste recycling has negative impacts, which include exploitation by waste buyers and poor health and living conditions of the waste collectors who deal in waste picking. Though waste recycling is economically and environmentally viable to the Local and National Authorities, the waste collectors are subjected to a lot of exploitation by the middlemen and waste buyers who are strategically positioned in the economic hierarchy and can thus afford to dictate the market prices of the saleable goods in their own terms. This study therefore focused on the income earned from waste management strategies and the various alliances that are involved. The various assets namely social and financial capitals were also studied.

Most third world cities do not collect all the wastes generated by their residents, which has a negative impact on human health and the environment. The informal refuse collection can be a profitable activity; in some areas local entrepreneurs provide the services at a fee and according to Medina (1997) the refuse collection earns three times the city's minimum wage. In Mexican city of Nuevo Laredo and in Texas they earn five times the minimum wage putting them in the top 3% of income earners in the city. Though refuse collection is a profitable venture and waste collectors can benefit from it, the contention of this study is that most of the urban populations is poor and therefore cannot afford the fee charged by the door to door refuse collectors making it difficult to be a sustainable worthwhile venture. Also in

areas where refuse chambers are provided for the urban populace has by choice or design opted not to use them which explains why waste is strewn all over the streets of our towns.

Cointreau (1982) has estimated that up to 2% of the population in Third World countries survive by recovering materials from waste. This strategy is referred to as scavenging. Waste collectors search for materials to sell for recycling, repair and reuse. Scavenging is important for the environment and for economic gains as it provides an income to the waste collectors; it also supplies cheap raw materials to industry and reduces demands for equipments and facilities that would have been used for collection, transportation and disposal. It also eases the pressure on the environment. Ouano (1991) states that Indonesia waste collectors reduce the amount of waste that need final disposal by one third, which has significant environment and economic benefits. When scavenging is seen as a strategy for solid waste management by Municipal Authorities, it can achieve good earnings for the waste collectors and improve their working and living conditions. The waste collectors provide the raw material needed to propel the local artisans "Jua Kali" who provide the ready market for their items. This in turn has a positive effect to the urban dweller who is able to access materials for use locally and cheaply. This study argues that waste collectors though seen as scam of the society by the public eye contribute significantly in reducing the final waste that is disposed or incinerated.

2.7 Waste Management and Health

Lack of adequate waste collection and disposal systems in developing countries causes public health problems resulting in diseases, which aggravates poverty and leads to negative consequences such as loss of income due to illness, increased spending on health care, and the deprivation of the poor's capability to live in a safer environment (World Bank, 2001). Poor solid waste management practises can lead to an escalation of dirt, stench and possibility of spreading diseases leading to epidemics. The World Health Organisation (WHO) policy on primary health care for all by the year 2000 stipulated that emphasis should be placed on basic preventive measures like safe drinking water, good sanitation and adequate waste management, rather than curative measures like building hospitals. The greatest risks are associated with the handling and disposal of clinical waste, which may remain potent for long periods after being removed from their source (Jerie, 2006). Such dangers are exacerbated in cases where waste are disposed off together with other domestic waste and are not sterilized or incarcerated at the source (Jerie, 2006). The local health facilities do not treat their wastes and ends up dumping them in the municipal dumpsite. The

local authority has also failed to provide incinerators in the dumpsites which would counter the effect of untreated waste. Therefore this study postulates that the inattention of both the local council and the health facility put the waste collectors in this sector in precarious working environment that are harmful to their health.

A survey conducted around a dumping site in Dandora (JICA, 1998), revealed that there are serious complains about, smoke, smell and broken glasses. Respiratory and stomach problems among children are common in the region. It is important to note that from the above, solid waste workers in their occupational and living environment are exposed to extremely hazardous conditions, which are detrimental to their health and this study examined the case in the municipal dumpsite in London, Nakuru.

Mishandling of solid waste could adversely affect the environment creating nuisance and poor habitation for the population. Due to the problems associated with disposal of waste most enterprises tend to use uncontrolled and unhygienic landfills as their predominant mode of disposal. Most waste generators have taken to combustion at the site, which causes air pollution problems whereas most private waste collection firms in order to avoid costs, dump in illegal places since the municipal authority lack an effective monitoring system (UNEP, 2005). This in turn leads to the pollution of the natural environment and may pose a substantial danger to public health and welfare. This study interrogated the methods used in solid waste management in the municipality and how they affect the environment of the waste collectors.

Waste is associated with environmental and health problems including the contamination of water supplies, soils and air including the spread of diseases (Hunt, 2002). There is a stigma of people who work with waste in poor urban areas and according to Slater and Chasca (2003), the negative images of waste and waste pickers in urban areas are a problem to be solved or a barrier to be overcome in pursuit of urban development. From the above Slater and Chasca sees waste pickers as a problem that needs to be solved in order to attain urban development. The waste pickers are not a problem to be solved as contended, but this study considers them as a solution to the urban problems and they need to be recognized, assisted, strengthened and empowered so that their contribution to urban problems can be worthwhile.

Slater and Chasca (2003) raises a pertinent question whether the informal urban waste sector given the health risks associated with it is an appropriate place to try and support the livelihoods of the poor people. Health is one of the most important human capitals that the solid waste actors have at their disposal but given that waste management has been considered as a survival strategy by the rapidly increasing unemployed urban populace the onus remains with the waste collector on whether livelihoods should be supported on such an unsafe environment. Nevertheless it merits mentioning that one of the core responsibilities of the local council is to provide safe environment for their citizens. It therefore becomes the responsibilities of the various environmental institutions and processes to ensure that the citizens are not deprived of a safe environment as they labour for a sustainable livelihood.

Mwangi (2000) studied partnerships in solid waste management in Nakuru municipality while Post and Mwangi (2006) studied community action and service delivery in the Nakuru municipality. The present research goes beyond and adds the dimension of livelihoods in solid waste management within Nakuru municipality by the waste collectors.

2.8 Summary of Literature Review

Some of the emerging salient issues in the foregoing literature review are that solid waste management provides an alternative source of income and employment to the waste collectors, but there appears to be a paradox in the scholarly aptitude in that some scholars argue that the waste management is not the right place to earn a livelihood where as, a number of scholars have identified that the waste management, reduces pollution in the environment and in some counties they are among the top earners in the economy. The laxity of the institutions to enforce the transforming process in ensuring that the waste collectors work in an apt environment perpetuates the belief that livelihoods cannot be supported in the waste dumps contradicting the earlier version. That not withstanding recycling and re use are seen as a source of cheap raw materials which supports the informal sector and therefore needs much attention in providing the solutions needed for urban development.

2.9 Theoretical Framework

This study proposes a livelihood approach by the various agencies as a theoretical perspective in understanding the livelihoods of the waste collectors in general and those involved in solid waste management in particular. The livelihood approaches refocuses development efforts on the elimination of poverty and encouragement of economic growth which benefits the poor

through sustainable development which targets policies that create sustainable livelihoods for the poor by promoting human development and conserving the environment (Solesbury, 2003). In pursuit of sustainable development it is required that political systems secure for citizens the opportunity to participate effectively in decision making. Also required is an economic system that generates surpluses and technical knowledge on a self reliant and sustainable basis. Another requirement is a social system that provides for solutions for the tensions arising from disharmonious development. A production system that respects the obligations to preserve the ecological basis for development and a flexible administrative system that has the capacity for self correction is also required (Solesbury, 2003). Based on the above this study was guided by the livelihood approaches as used by United Nations Development Programme (UNDP) and United Kingdom Department for International Development (DFID).

2.9.1 DFID Livelihood Approach

Department for International Development (DFID) adoption of sustainable livelihood approaches stems directly from its 1997 white paper on international development where they affirmed their aim in elimination of poverty in poorer countries. According to DFID's approach poverty reduction activity should encompass the following principles: -

1. People centred sustainable poverty elimination will be achieved only if support focuses on the aspirations of the people. In solid waste management the aspirations of the waste collectors is to earn a living. So the waste collectors should be supported to enhance poverty elimination by instituting structures and processes that will ultimately lead to improving their working conditions

2. The waste collectors must be involved in identifying their needs. The waste collectors have suffered from several strains and stresses like unemployment, poverty, and globalisation and therefore there is need for planners to involve them in identifying the strategies, which will enhance poverty reduction.

3. Multi level – poverty reduction is a big task that require concerted effort by all the stakeholders. The waste collectors have various assets that can be used to attack poverty in its multi-faces for instance some have the education required to dispose of

the clinical waste while others have their physical energy to offer and therefore all should be incorporated in a continuum.

4. Poverty elimination should be conducted in partnership with both the formal and informal sectors. The municipal governments should recognise the contributions made by the informal sector in waste reduction compared to the formal sector for instance the Jua Kali sector is greatly involved in collecting metals for sale in the industrial area.

5. Poverty elimination should be sustainable, economical, institutional, social and environmentally viable. Solid waste management leads to minimisation of environmental pollution, which is economical to the municipal government and the government. This leads to sustainability as resources are saved. The environment becomes viable in that people are not completely exposed to the stench generated by rotting waste. Socially solid waste management leads to development of networks of association between the waste pickers and the buyers and the general citizenly.

6. Dynamic positive changes should be embraced and people should develop long-term commitment. Solid waste management enhances an improved livelihood as a result of the income generated which make people ascribe to new status like owning land and educating the children

7. DFID stresses the importance to livelihood capitals or assets and distinguishes five assets, which are natural assets, social assets, physical assets, human assets and financial assets. The waste collectors in solid waste management exploit these assets in order to attain a better livelihood.

The limitation of this approach is that concepts such as political assets seem to be under emphasized. It is important to note that the municipal authority is the power broker in solid waste management and even determines who should operate in given parts of the town. Politics is an important dimension in solid waste management because issues like governance, corruption, power relations, policy and decision making mechanism can only be achieved when there is a political good will. This therefore prompts the researcher to include the UNDP approach which incorporates the political asset in solid waste management.

2.9.2 UNDP'S Sustainable Livelihood Approach

In the United Nations Development Programme (UNDP) the sustainable livelihood agenda is part of the organisations overall sustainable human development (SHD) mandate that was adopted in 1995. The mandate includes poverty eradication, employment and sustainable livelihood, gender, protection and regeneration of the environment and governance. As one of UNDP's mandate sustainable livelihood offers conceptual framework for poverty reduction in a sustainable manner by incorporating the assets which are defined as: -

1. Natural/ Biological assets, which include land water, common property resource, flora and fauna.
2. Social assets, which include community, family and social networks.
3. Human assets, which include education, labour, health and nutrition.
4. Physical assets, which include roads, clinics, markets, schools, and bridges.
5. Economic assets, which includes jobs, credit and saving.

The sustainability of livelihoods become a function of how men and women utilise assets portfolios on both short and long term basis to be able to cope with and recover from shocks and stresses through adaptive coping strategies they should be economically sound, ensuring that livelihoods activities do not irreversibly degrade natural resources within a given ecosystem. They should also be socially equitable with a promise for future generations. UNDP brings together the issue of poverty, governance and environment and employs an asset-based approach and stresses the need to understand adaptive and coping strategies in order to analyse the use of different types of assets. This approach explains how the waste collectors can cope with shocks and stresses and earn a livelihood through solid waste management.

The two agencies (UNDP and DFID) share much in common notably the focus on assets and capabilities, they all emphasis on how the waste collectors can utilise their assets for attaining a better standard of living. All agencies adopt an asset-based approach though there is a slight difference in the number of assets considered. For instance the DFID (human, social, Natural, physical and economic assets), whereas the UNDP has an additional asset to those of DFID referred to as Political assets. UNDP is the agency that explicitly stresses on technology in its framework. It is not yet clear whether this has a specific impact on development activities but we argue that solid waste management requires a lot of technical expertise and technology in

refuse disposal and recycling. DFID supports many technological programmes but it views it only as an asset included in the human capital.

Solid waste management and urban poverty can best be understood from the point of view of these approaches, which compliment each other in their weaknesses and strengths and opportunities and strength. . Due to urbanisation and globalisation the waste collectors have lacked access to basic necessities of life. Solid waste management as a source of income has provided livelihoods for the waste collectors. Due to methodological diversity of the DFID approach all the assets of the waste collectors or their strengths are put into consideration in the attainment of a livelihood.

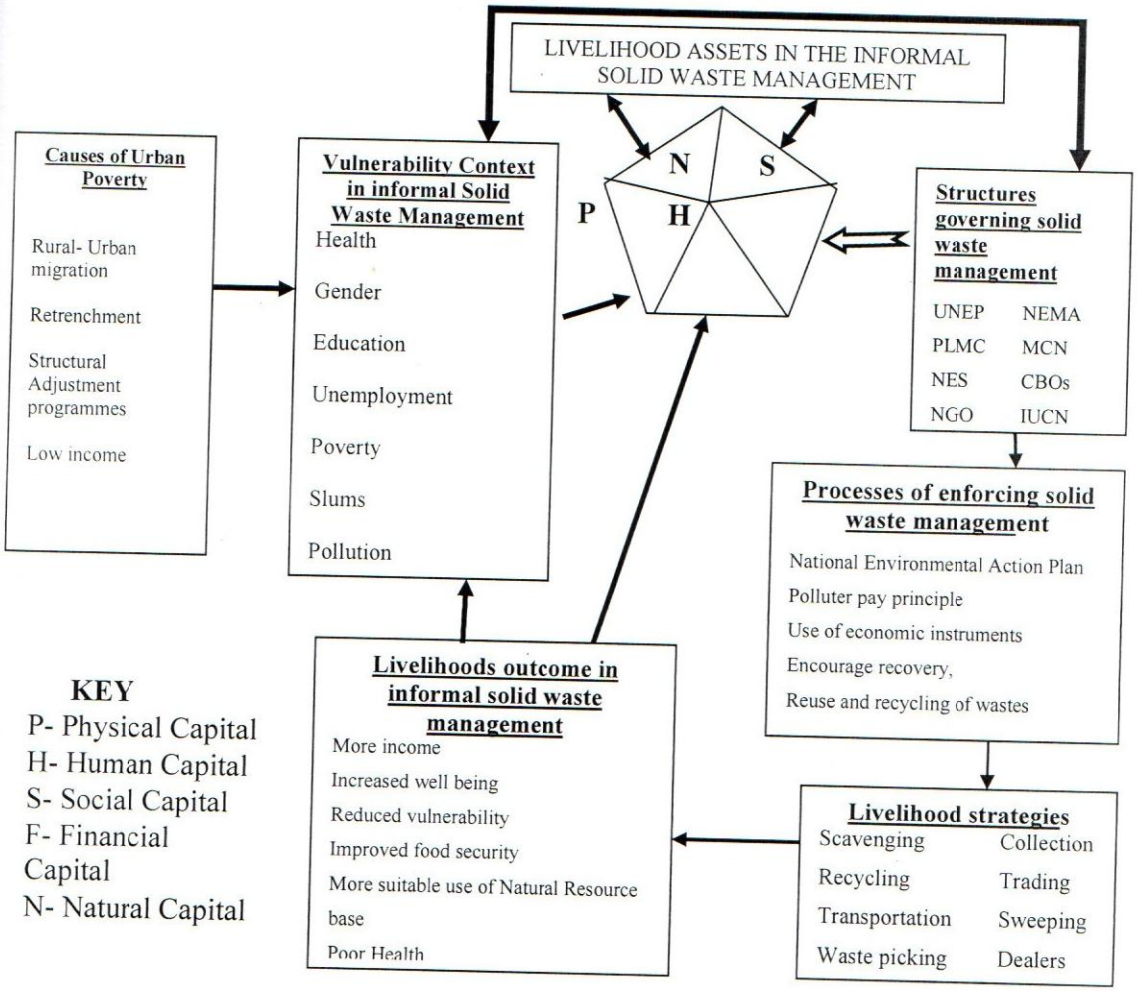
These approaches are best suited as they stress on utilising and building on the best existing tools for the circumstances at hand which may include recycling, composting, reuse and even incineration and also an analysis of how they will affect the environment by incorporating the sustainability context. These approaches stress the need for livelihoods approaches to be underpinned by a pro- poor bias and to be informed by prior social analysis to ensure that vulnerable groups are not neglected.

2.10 Conceptual Framework

This study deals with solid waste management and its effectiveness on reduction of urban poverty and how one can apply the Sustainable livelihood conceptual framework in urban areas to reduce poverty. As stated above households are considered poor when the resources they command are insufficient to enable them to consume goods and services to achieve a minimum level of welfare. The conceptual framework is not a general model but has relevance to livelihood strategies with regard to informal solid waste management, the model comprises of five key elements. The first one is the shock context, which are the source of insecurity to which the poor and their assets are exposed to due to factors such as industrialisation and globalisation, rural- urban migration and rapid urbanisation and the escalating level of slums households, which subject these individuals to their vulnerability in terms of high levels of poverty, increased rate of unemployment and environmental pollution. This framework therefore explains the causes of the vulnerability that has resulted to the waste collectors working in solid waste management.

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The other element is the livelihood assets, which comprises all assets that individual households and institutions, use to maintain their livelihoods. It is assumed that the people involved in this sector were capable of earning livelihoods through other means like formal employment but due to lack of opportunities and lack of options they end up in solid waste management. Efforts should be directed towards the strengths of the households and individuals to utilise these assets in the management of solid waste.



Source: Modified DFID Model (Carney *et al,* 1999)

Figure 2. 2: Conceptual Framework

Assets to and use of the capitals is influenced by policies and structures that govern individual and institutions. For instance the municipal by- laws, National rules and even

institutional policies like those of the National Environmental Management Authority (NEMA) influence the actors. From these policies we get livelihood strategies, which in solid waste management include, reuse, and recycling, composting, scavenging and informal collection of waste. These strategies lead us to the attainment of sustainable livelihood outcomes like improved income, improved housing, and education for children and quality environment among many other positive outcomes. This in turn leads to an improvement in the assets that an individual posses.

Mwangi (2008) observes that urban governance faces economic and political choices, which are not simply for the poor, or against the poor and the choices about what does and does not support secure urban livelihoods are not clear. Devas (1999) notes that cities all over the world face a dilemma: the paradox of growth and equity. That entails using the available resources to eradicate poverty or advancing economic growth to achieve both goals of development and poverty eradication. The framework calls for the inclusion, of the informal sector in decision making, to encourage participation. Every citizen should be given an opportunity to participate in development matters that contribute to their well being. The framework calls for the participatory approach in providing both economic and political solution to the development and sustainability of urban development and urban livelihoods in Nakuru municipality.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

Nakuru town is 160 kilometres North West of Nairobi and it is the fourth largest town in Kenya after Nairobi, Mombasa and Kisumu. It is sandwiched between Lake Nakuru National Park to the south and Menengai Crater and associated volcanic landscape in the North. In the North eastern part is the Bahati escarpment, which forms the western slope of the Aberdare ranges (Figure 3.1). According to the 1999 population census the Town's population is approximately 350,000 and the population growth rate is approximately 5.6% per annum. Therefore the population is projected to be 760,000 in 2015, which is approximately 50% of the current levels. The urban population has been influenced by high birth rates, rural-urban migration and boundary extensions. Currently, the larger town's population is concentrated within the existing municipal boundary. The highest densities are found in the public housing triangle, Langalanga, Freehold, Shabab, Kenlands, Kaptembwa and Central Business District (CBD). These are well-established serviced and accessible housing estates south of the CBD and the main industrial area. Here, most community facilities are already provided. Because of these factors, these areas do and will continue to attract more population in the future.

Another area of high population concentration is located directly north and south of the eastern industrial area (Nakuru Blankets) and includes Kiratina and Free Area housing estates. The concentration of population in this area is the result of the availability of cheap land for housing development through private initiatives. These estates are however not well serviced and lack basic support/community level facilities such as, schools, hospitals and recreational facilities. Population in the peri-urban areas, such as, Ngata, Engashura, Mbaruk, Worker's, Kiamunyeki, Wanyororo, Kiambogo, etc, is increasing significantly for the same reasons. They also lack essential services and facilities. Areas with relatively lower population densities include Naka, Block 14 and Block 17. These areas are not adequately opened-up due to lack of services. Milimani and Lanet areas have low population densities due to the relatively large plot sizes.

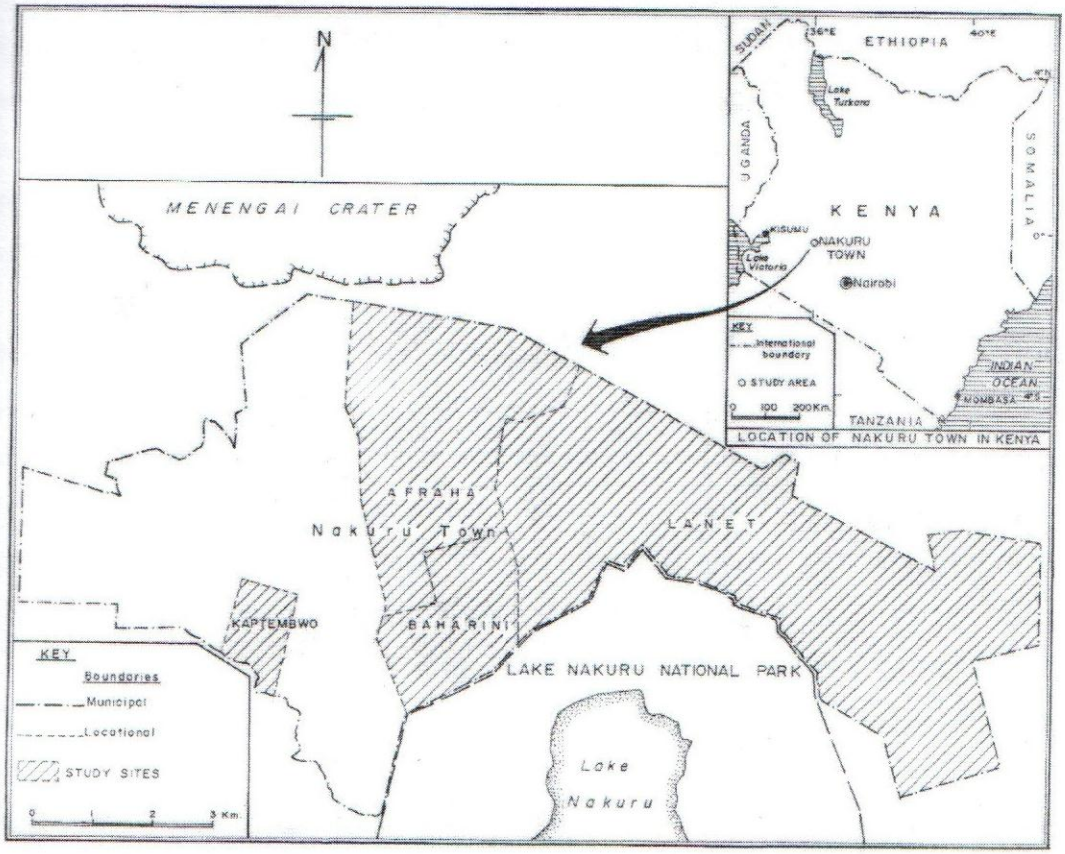


Figure 3. 1: Map of Nakuru Municipality Showing the Study Site

Public housing areas are generally well planned with provision made for wide roads, open spaces and space for public utilities. Most private housing areas, especially low-income are poorly planned. Development control is almost non-existent and housing development is haphazard and may not take cognizance of required standards. Similarly, these areas are poorly served with physical infrastructure and services. Since quite a large portion of private housing is developed in the rural-urban interface (peri-urban) areas, the municipal authorities do not provide services and thus private initiatives are the only hope for servicing the areas (MCN, 1999).

According to MCN (1999) Nakuru is the 'farming capital' of Kenya. It is located in the Rift Valley, within the rich agricultural highlands, formerly known as "the White Highlands". Locally, the town is sand-witched between the scenic Menengai Crater to the north and the Lake Nakuru National Park to the south. The latter is famous for its rich variety of fauna and flora. Its attractive climate and central location (along the Kenya-Uganda railway and the

Trans-African Highway and within the fertile agricultural hinterland) are some of the significant factors that have influenced the town's growth. There has been a tremendous increase in its population over the past three decades. This has led to an increase in demand for basic services and infrastructure such as housing, water and sanitation, roads, among many others. This in turn has put a strain on the available resources, and increased challenges to the municipal council to meet the needs of the town's inhabitants.

Increasing urban activities in Nakuru municipality are encroaching on prime agricultural land, and onto areas, which due to their physical and natural characteristics are unsuitable for urban development. Consequently, the capacity of local authorities to provide services for their urban populations is outstretched and in most cases, one third of the population live in sub-standard housing with no basic infrastructure and services such as, water sanitation drainage and waste refuse chambers (MCN, 1999).

The management of solid wastes in Nakuru town is primarily the responsibility of the municipal council. However, according to Mwangi (2000) in recent years the private sector entrepreneurs have increasingly been involved in refuse collection and disposal. The collection of domestic waste, where it exists is on a house to house basis while institutions, factories and other enterprises are supposed to be provided with refuse storage facilities from which waste is meant to be collected regularly, but still there is evidence of uncollected waste with heaps of garbage in the main municipal market and streets.

3.2 Research Design

The study used the case study research design which is an intensive study of a single group, incident, or community. They provide a systematic way of looking at events, collecting data, analyzing information, and reporting the results. As a result the researcher may gain a sharpened understanding of why the instance happened as it did, and what might become important to look at more extensively in future research. The design is an in-depth investigation of a single instance, in this study being the case of poverty alleviation through solid waste management. A case study was chosen for this study due to its multi method approach which will maintain the integrity of the whole solid waste management with its myriad of interrelationship to livelihoods, living conditions, health and sustainability. A case study provides sufficient and supportive findings, which increases confidence in a theory's predictive power.

3.3 Unit of Analysis

The unit of study was the waste collectors in solid management within the municipality. The study identified the various partners in solid waste management within the municipality and then studied the various waste collectors in the informal sector.

3.4 Sampling Procedures

The study employed the random sampling and purposive sampling techniques. The random sampling techniques were used to select the actors from the informal organizations because the information can be attained from the Municipal Council of Nakuru. The Purposive sampling technique was used to track down informal actors. The snowball sampling where respondent's guided us to the next respondent was used, since there are no records for most waste collectors in the informal sector. It is important to note that most of the activities were carried within the industrial area of the municipality the residential areas and the Central Business District. The municipal dumping site is located within the municipality and it acted as a guide in tracking down the actors in the informal sector. The population growth rate and the reciprocity of actions undertaken by the actors coupled with the increase in unemployment rate prompted the researcher to select an equal representation from the four locations which form the municipality.

Locations	Total Population (RoK, 2001)	Waste collectors from each Location
Lanet	36,428	32
Kaptembwo	108,234	93
Baharini	49,521	43
Afraha	27,574	24
TOTAL	**221,757**	**192**

Table 3. 1: Sample Size

The researcher obtained a list of community based organisations registered with the Municipal Council of Nakuru and self help groups registered with the Department of Social Services dealing with solid waste management. The organisations were then categorized into the four locations depending on where they operate. The four Locations in Nakuru municipality are Lanet, Kaptembwo, Baharini and Afraha. From each Location the waste

collectors were proportionately sampled. The researcher interviewed a total sampling frame of 192 waste collectors based on Cochran (1977) for populations that are large, to yield a representative sample for proportions. Which is valid where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area at the tails (1 - equals the desired confidence level, e.g., 95%), e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is 1-p. The value for Z is found in statistical tables which contain the area under the normal curve.

$$N_0 = \frac{Z^2 pq}{e^2}$$

3.5 Data Collection Instruments

Primary data was collected using both qualitative and quantitative techniques so as to adequately elucidate the necessary data. Quantitative data were collected using structured interview schedules which is advantageous in that it makes it easy to compare different sets of data. Qualitative data collection methods were used to supplement the interview schedules where observations and in-depth discussions were undertaken.

Secondary data was also used to supplement the primary data. This included documented information from on solid waste management in the study area from the relevant government offices, agencies and even institutions that undertake solid waste management.

3.6 Data Analysis

The Data collected was analysed using both the descriptive and the inferential statistics. The descriptive statistics were used to show the frequency distributions of income, house types, and years of service in solid waste management, strategies of solid waste management and frequency of waste collection. The various descriptive techniques like pie charts, histograms and percentages have been used.

The crammer's V was applied in the study to examine the various relationships and associations that informed the research. It has been used to show the relationship between

standards of living and income generated from the waste, the relationship between occupational health and working condition in solid waste management, the relationship between income generated between the informal and formal solid waste managers and the relationship between income generated and the house types. The Data was analysed using the Statistical Package for Social Science (SPSS).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Results

This thesis examines the livelihood of the waste collectors in Solid Waste Management within the Nakuru municipality. This chapter presents the finding and the discussion of the results. The findings cover the age composition and gender profile, income generation, the occupational health hazards and the various strategies used in Nakuru municipality. The findings also highlight the income generated, the assets portfolio and the vulnerability context encountered by the individuals in solid waste management.

Livelihoods were envisaged in the Sustainable livelihoods framework and incorporate the five assets which laid the basis of this study namely, Physical, Social, Natural, Financial and Human Capitals. These assets are conceptualised through income generation, educational level, residential status, and how this income has been able to assist in educating the dependants of the respondents. Occupational health hazards and the various strategies used by the waste collectors were also examined. The following are the findings of this study.

4.1.1 Age Composition and Gender Profile

Age is a very important socio- economic factor in terms of how it influences the demographic characteristics of the respondent. It also influences the level of participation and decision making towards the attainment of sustainable livelihoods. Table 4.1 indicates that in this study, the 192 respondents were distributed between four categories. Those aged below 25 years formed 19.8% of the study while the majority who comprised of 51% was aged between 26 and 36years of age. The age group of 36-45 consisted of 22.9% of the respondents while 6.3% of the respondents were in the age bracket of 46 years and above.

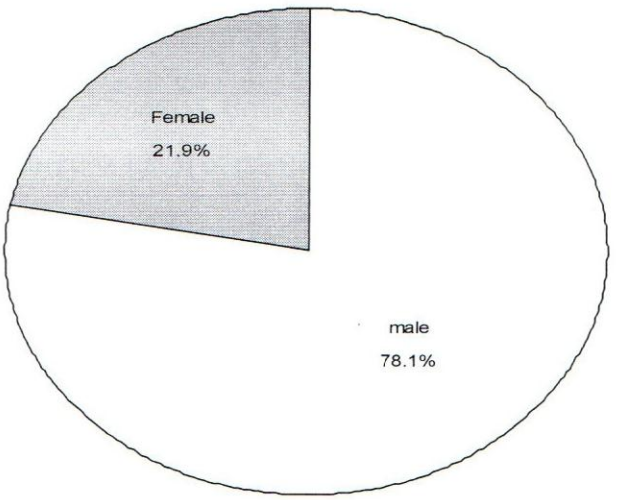
Age Categories	Frequency	Percent
Below 25	38	19.8
26-35	98	51.0
36-45	44	22.9
Above 46	12	6.3
TOTAL	**192**	**100.0**

Source: Field Data (2007)

Table 4. 1: Distribution of the Respondents by their Age Categories

The cumulative percent of 93.8% of the respondents being aged below 45 years portrays a population that was still fairly young brisk and productive. These are the years when one is considered to be very active in life and when one is considered to be most industrious.

Gender also influences participation and involvement in solid waste management and therefore plays an important role in determining who benefits from solid waste management. Figure 4.1 summarizes the gender distribution of the respondents.



Source: Field Data (2007)

Figure 4. 1: Gender Distribution of the Respondents

The Figure 4.1 indicates that 21.9% of the respondents were females while 78.1% were males. The gender disparity can be explained in terms of the role expectations the society has assigned to the different genders. This can also be attributed to the role of women as mothers

and men as the *de jure* providers for their families. Lastly searching and collecting of solid waste involves walking for long distances in search of waste materials and therefore men are more mobile than women.

4.1.2 Respondent's Education and Frequency of waste Collection

4.1.2.1 Respondent's Education

Education is an important human asset and determines one's ability to make informed choices and make rational decision that in the end will lead to improved livelihoods. In solid waste management education is an important asset since the goods collected are sometimes harmful, unsafe and risky and the way to handle them requires an understanding of how hazardous they are. Table 4.2 shows the education level of the respondents.

Education Level	Frequency	Percent
Did not attend School	9	4.7
Primary School	119	62.0
Secondary School	59	30.7
Tertiary Institutions	5	2.6
TOTALS	**192**	**100.0**

Source: Field Data (2007)

Table 4. 2: Education Level of the Respondents

Table 4.2 shows that 62.0% of the respondents had attained education upto primary school while only 2.6% of the respondent's had gone beyond secondary school education. This suggests that 95.3% of the respondents had some formal education though the majority had very basic education, however, it is assumed that they could collect, transport and sort the solid waste diligently and intelligently aware of the risks involved. The study also found that 4.7% of the respondents had not attained any formal education and were therefore susceptible to the risks involved.

4.1.2.2 Educational Level and Waste collected

Educational level determines the type of waste that a waste collector will engage in and the safety precautions that one will undertake for enhanced sustainable livelihoods.

Educational level of the respondents	Type of Waste Collected %					Total
	Frequency	Scrap Metal	Plastic	Garbage	Papers	
Did not attend school	9	0.5	1.6	1.0	1.6	**4.7**
Primary school	119	15.1	27.1	11.5	8.3	**62.0**
Secondary school	59	11.5	8.3	5.2	5.7	**30.7**
Tertiary	5	1.6	0.5	0.0	0.5	**2.6**
Total	**192**	**28.6**	**37.5**	**17.7**	**16.1**	**100.0**

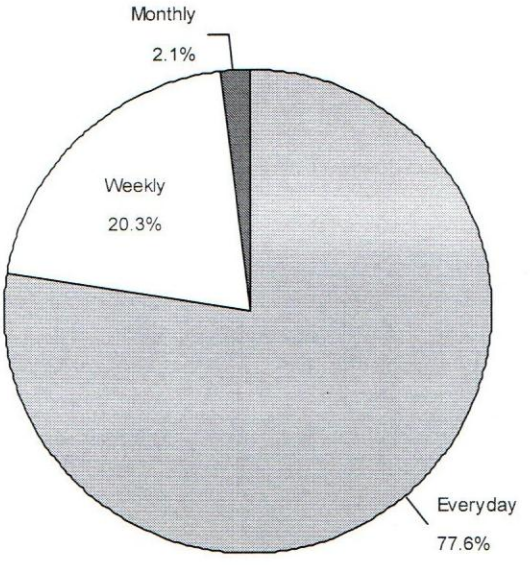
Source: Field Data (2007)

Table 4. 3: Educational Level and Type of Waste

Table 4.3 shows the relationship between the level of education amongst the respondents and the types of waste they collect. The table shows that in the category of those who did not attend school and the primary school category most of the respondents were collecting plastics while in the categories of secondary school and tertiary school education most of the respondents were collecting scrap metals. This can be explained by the fact that the plastic waste had many actors involved and therefore the most educated people in the sector go for the scrap metal. The study has therefore established that as the respondents were moving higher on the academic ladder the less favourable rotting garbage waste became. Plastic as a type of solid waste is also dependent on the level of education as the study found out. The higher the educational level the fewer respondents were willing to collect plastic wastes.

4.1.2.3 Frequency of waste Collection

The frequency with which solid waste management was collected is important to this study since it shows how the respondents were dependent on solid waste management as a source of livelihood. It also shows the availability of waste and how it is accumulated over time. Figure 4.2 summarizes the frequency of waste collection by the respondents.



Source: Field Data (2007)

Figure 4. 2: Respondent's Waste Collection Frequency

The Figure 4.2 shows that 77.6% of the respondents collected waste on a daily basis while 20.3% collected on weekly basis and 2.1% on a monthly basis. Therefore from this observation it is evident that a majority of the waste collectors in this sector are dependent on solid waste management in the attainment of their livelihoods as a daily activity. It is therefore apparent that this sector provides informal employment for the sustenance of livelihoods.

4.1.3 Solid Waste in Nakuru Municipality

The provision of Solid Waste Management services is essential for the maintenance of a clean living environment and in enhancing the aesthetic qualities of neighborhoods. In Nakuru, household, commercial and industrial activities generate a lot of waste. All these rely on municipal waste collection and disposal services. These are inadequate and their provision is limited to activity areas within the town. The MCN estimated that it collects around 57 tonnes of solid waste on average per day with its three working trucks while the private sector collects around 24 tonnes per day.

The types of municipal waste generated include household, commercial and industrial waste, and livestock manure. Most recyclable material plastics, papers and metals are usually picked out by waste collectors in the town before the waste is dumped. Nakuru town has only one designated dumping site located on the Western side of the town (London) where, open dumping in an abandoned quarry site is practiced (Plate 4.1).



Source: Field Photos (2007)

Plate 4. 1: Nakuru Municipality Dumpsite (London Estate)

Plate 4.1 shows the designated waste dumping site in the municipality with waste thrown allover. The dumpsite is filled with plastic papers, refuse and rotting garbage. Most of the respondents collect their "valuable" waste from these dumpsite and a few individuals have put up recycling plants next to the dumpsite for easy access to their recyclable waste.



Source: Field Data (2007)

Plate 4. 2: Free Area Estate Dumpsite

Plate 4.2 shows a designated dumping area in Free Area where a portable waste container is strategically located. However, majority of waste producers dump their refuse outside the container and the whole area is littered with waste. In some instances the municipal authority does not empty the containers in time and therefore scenes of overflowing waste from the containers are evident. This therefore explains why the waste producers are not keen on dumping their waste products inside the containers since they have been accustomed to spectacles of waste overflowing from the portable waste containers.



Source: Field Photos (2007)

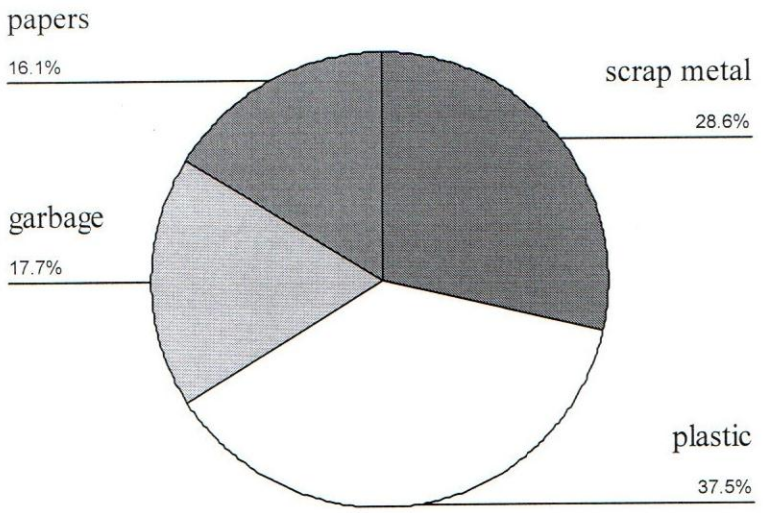
Plate 4. 3: Solid Waste thrown in one of the Streets in Bondeni Nakuru

Plate 4.3 is an undesignated dumping site in one of the streets within the municipality where the residents have resulted in disposing waste in one of the roads. In this case the waste is either burnt or left unattended. This, coupled with inadequate collection services, has led to deterioration in the quality of urban living environments as the plastic bags continue to choke the environment because of their non biodegradability properties. This further highlights the main problems confronting solid waste management which include poor organization, low public awareness on environmental health, lack of adequate personnel and appropriate equipment and the use of poor waste handling techniques. It is therefore in this context that this study outlines the contribution of the informal sector in solid waste management within the municipal boundaries.

4.1.4 Types of Waste

The livelihood of the urban waste collectors and the income derived from waste management is partly determined by the type of waste that the waste collectors are engaged in. This is

because the type of waste that is collected by the waste workers has an attached economic and social value and therefore will determine the profitability of the end product.



Source: Field Data (2007)

Figure 4. 3: Types of Waste Collected

Figure 4.3 shows the four categories of the types of wastes collected by waste collectors in this study which included plastics 37.5%, scrap metals 28.6%, decomposing garbage 17.7% and papers 16.1%. Plastics were greatly preferred by the waste collectors partly because they are readily available and secondly because they have immediate use which makes them easy to sell. Scrap metals was also preferred by over a quarter of the respondents because they are also readily available especially at the industrial area and the garages. Scrap metals also fetch a higher price compared to the rest based on the quality and quantity of the scrap. Only a few respondents were involved in collecting decomposing garbage, this is because of its limited usage which does not translate to earning income however a few of the respondents used it for composting while the majority of the respondents earned income by transporting the waste to dumpsites. Though the availability of waste papers in the municipality is high only a few of the respondents in this study were involved in waste paper collection. This is partly because of the bulkiness of the papers and lack of immediate pre- processing use.

4.1.5 Income Generation and Solid Waste Management

4.1.5.1 Income Generated from Informal Waste Collection

Income influences the socio-economic status of waste collectors in the society and also determines the sustainability of livelihoods in the community. The study established that the urban waste collectors were earning some income from solid waste management in the municipality.

Respondents Income (Ksh) Per Month	Frequency	Percentages%
Below 5000	125	65.1
5001 - 10000	25	13.0
Above 10000	42	21.9
Total	192	100

Source: Field Data (2007)

Table 4. 4: Income Generated from Solid Waste Management

Table 4.4 shows that majority of the respondents (65.1%) were earning an income of less than Ksh. 5000 per month, 13.0% were earning an income of between Ksh. 5001-10000 while 21.9% were earning an income of above Ksh. 10000. In order to establish whether there was a relationship between the type of waste collected and the income generated, a cross tabulation was undertaken as shown in Table 4.5.

Income (Ksh)	Waste Types				Total
	Scrap Metals	Plastics	Garbage	Papers	
Below 5000	30 (15.6%)	58(30.2%)	16(8.3%)	22(11.5%)	126(65.6%)
5001-10000	7(3.6%)	2(1.0%)	15(7.8%)	0(0%)	24(12.5%)
Above 10000	18(9.4%)	12(6.3%)	3(1.6%)	9(4.7%)	42(21.9%)
Total	55(28.6%)	72(37.5%)	34(17.7%)	31(16.2%)	192(100%)
Cramer's V Value of 0.373 at 0.000 significant level					

Source: Field Data (2007)

Table 4. 5: Relationship between Income Levels and Type of Waste

A cross tabulation between the waste collectors earning less than Ksh. 5000 and the type of waste collected reveals that majority of the respondents were earning income from the plastics waste (30.2%) followed by scrap metal waste (15.6%) and paper waste (11.5%) and rotting garbage (8.3%) respectively. It is therefore evident that collection of plastic waste is widespread among the low income earners in this sector compared to rotting garbage waste.

In the category of Kenya shillings 50001 – 10000 rotting garbage waste collectors had the majority (7.8%) followed by scrap metals (3.6%), plastics (1.0%) while paper waste had no response. Therefore in this category of income, garbage waste was the most prevalent mode of income generation whereas paper waste is not considered as an option of income earning by the waste collectors.

In the last category of waste collector earning above Ksh. 10000 majority of the respondents were dealing with scrap metal (9.4%) followed by plastics (6.3%), papers (4.7%) and garbage collection (1.6%). Therefore scrap metal dealership was the most common among the high income earners in this sector. It can therefore be contended that waste collectors pick waste for survival and due to the influx of a large number of unemployed people in this sector the majority end up in collecting the plastic waste making it a low income enterprise while the few wealthy people deal with scrap metal and therefore monopolise the sector. A Cramer's V value of 0.373 at a significant level of 0.000 was attained and we therefore conclude that there was a statistically significant relationship between income generated and the type of waste collected.

4.1.5.2 Income generated and the Livelihoods of the Waste collectors

Central to the livelihood studies is the notion that the waste collectors may not have the finances for sustainable livelihoods but they have their skills, health and knowledge which they can use to identify their strength's and opportunities. Physical capital includes household goods and even shelter. In urban centers houses have been used as collateral for acquiring loans and therefore the study of the residential status of the respondents in this study is imperative.

Income (Ksh)	Residential Status		Total
	Owner Occupied	Rented	
Below 5000	7 (3.6%)	119 (62%)	126 (65.6%)
5001 – 10 000	1 (0.5%)	23 (12%)	24 (12.5%)
Above 10000	22 (11.5%)	20 (10.4%)	42 (21.9%)
Total	30 (15.6%)	162 (84.4%)	192 (100%)

Source: Field Data (2007)

Table 4. 6: Relationship between Income and Residential Status

Table 4.6 shows that, 15.6% of the respondents were living on their own homes while 84.4% were living on rented houses. This therefore shows that 15.6% of the respondents were in a position to benefit from their homes by saving on rent, secondly they could earn income as rent from their homes, thirdly they could develop home based enterprises "yards" for their collected waste and lastly their houses could be used as collateral in acquiring loans from financial institutions.

From Table 4.6, 3.6% of the respondents earning below Ksh. 5000 were living in owner occupied residential houses while the majority (65.6%) were living on rented houses. This can be understood from the point of view that some residents had inherited some properties from their parents and have therefore developed them and were living on these properties. It can be argued that majority of the respondents in this study were living in rented houses because they were sacrificing the ability to access and utilize an asset in future because of shorter shocks and stresses and once these shocks and stresses are surmounted the assets will be acquired.

Education is an important human asset in livelihood studies. In modern urban societies educating children is the norm and a responsibility of the household heads. This study therefore embarked on establishing whether the waste collectors in solid waste management were using their income to educate their children. The cost of education especially in post primary institutions has been on the increase and therefore educating children becoming a formidable task and therefore in this study educating ones children was considered as an indicator of sustainable use of income generated from waste towards the attainment of livelihoods.

Income (Ksh)	Respondents children in School		Total
	Yes	No	
Below 5000	55 (28.6%)	71 (37%)	126 (65.6%)
5001 - 10000	17 (8.9%)	7 (3.6%)	24 (12.5%)
Above 10000	39 (20.3%)	3 (1.6%)	42 (21.9%)
Total	111 (57.8%)	81 (42.2%)	192 (100%)

Source: Field Data (2007)

Table 4. 7: Relationship between Children in School and Income

Table 4.7 shows that 57.8% of the respondents had children in school and they indicated that they were supporting their children education with the money earned from waste management. In the category of those earning, Ksh. 5000 and below, 28.6% of the respondents had children in school while those earning over Ksh. 10000 had 39% children in school. This therefore proves that the income generated was supporting human assets through education.

It is important to note that some of the respondents had no children in school because they had no children or their children had not attained the school going age and some of the respondents had finished educating their children and therefore it cannot be assumed that having no children in school meant that the income earned fro solid waste management was not supporting livelihoods.

Community and individual objectives can be achieved by strengthening the rules, norms, obligations, trusts and networks of reciprocity which are entrenched in social relations, social structures and social institutions. Individual members come together and develop social capital so that they can maximize on the benefits accruing from these social relations. Box 4.1 is a synopsis of one group within the municipality of members with the same objective of generating income from solid waste management but has formed a community based organization so that they can benefit individually from collective action. Nakuru Waste Collectors and Recyclers Management (NAWACOM), has a membership of 146 waste collectors who come together to form a community based organisation that help in reducing waste in the municipality and at the same time assist the waste collectors in earning an income.

Box 4. 1: A case study of Community Based Income Generation

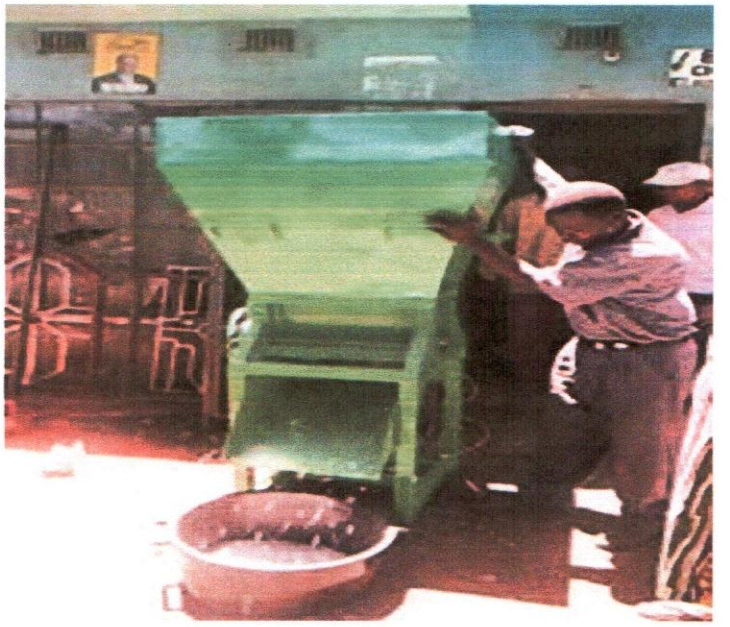
Practical Action is a Non Governmental Organization working closely with a group of solid waste collectors known as Nakuru Waste Collectors and Recyclers Management (NAWACOM), which has a membership of 146 waste collectors. Such community-based organizations play an important role in contributing to the management of solid waste generated in the municipality. They complement the municipal council's efforts by reducing the amount of waste to be collected as they retrieve the reusable materials. Plate 4.4 shows plastic waste collected from the dumpsite which will be recycled.



Source: Field Photos (2007)

Plate 4. 4: Plastic Collected for Recycling

Their activities are also a source of income, as they sell the recyclable materials to manufacturers. NAWACOM have a plastic shredder (Plate 4.5) which cuts plastics into smaller particles, so that it can be more easily packed for transportation to Nairobi (Plate 4.6 and 4.7). The plastic shredder produces 250 kg of plastic per hour from machine, which can be sold for 24 shillings per kilo. Some members of NAWACOM also operate a bone mill, which processes bones collected by members for eventual sale to manufacturers they purchase bones at 3 shillings per kilogram. In view of the benefits accruing from recycled waste, the Together For a Cleaner Nakuru project intends to put up a modern organic waste compositing plant.



Source: Photo Courtesy of NAWACOM (2007)

Plate 4. 5: Plastic Shredder belonging to NAWACOM

Plate 4.6 show shredded plastic which are now easily packed and the bulkiness reduced to manageable level which can easily be packed. Shredding the plastics also makes it easier to melt the plastic while recycling it. In some instances colour separation of plastics is undertaken before shredding because it is easier to sort them before they are shredded



Source: Field Photos (2007)

Plate 4. 6: Shredded Plastic

Plate 4.7 shows packed shredded plastics which are ready to be transported for recycling. The packing allow the plastics to be carried in large quantities bearing in mind that the plastics are not very heavy and therefore need large quantities so as to save on cost.



Source: Field Photos (2007)

Plate 4. 7: Shredded Plastics ready for Transportation

4.1.6 Occupational Health Hazards and Associated Risks

The study sought to identify effects that are common to most waste management processes within Nakuru municipality. Though all are not strictly health effects, they are none the less important, especially when health is seen as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Odour is unlikely to present a health hazard; but it may influence the local community's perception of the risks and lead to stress which is an occupational hazard. Dust particles are known to exacerbate various respiratory symptom including asthma and various allergies. Gaseous emissions or smoke fumes are known to have putative effects on human beings and may lead to congenital malformations at birth.

Awareness of Hazardous Material	Frequency	Percentage %
Yes	155	80.7
No	37	19.3
Total	192	100

Source: Field Data (2007)

Table 4. 8: Awareness of Hazardous Waste Materials

Table 4.8 shows the respondents awareness on their interaction with hazardous waste materials in the process of solid waste management. The table shows that 80.7% of the respondents perceive themselves to be interacting with hazardous solid wastes while 19.3% do not think that they come into contact with hazardous materials. This can be explained by the perceptions of the people that health hazardous materials lead to diseases and infirmities and therefore those who have not encountered any disease do no think that they come into contact with hazardous material.

In order to establish whether the respondents working in solid waste management were working in health risk environments, a set of the possible health effects of working in the sector were listed and the respondents were requested to list the ones that affected them. The following are the results as shown in Table 4.9.

	Cuts	Dusts	Oduor	Back/Head Aches	Smoke Fumes
	Frequency	Frequency	Frequency	Frequency	Frequency
Yes	131 (68.2%)	176 (91.7%)	123 (64.1%)	148 (77.1%)	134 (69.8%)
No	61 (31.8%)	16 (8.3%)	69 (35.9%)	44 (22.9%)	58 (30.2%)
Total	192 (100%)	192 (100%)	192 (100%)	192 (100%)	192 (100%)

Source: Field Data (2007)

Table 4. 9: Health Risks Associated with SWM

The study established from the responses that 68.2% of the waste collectors had received some cuts from waste while 91.7% were complaining of dust related ailments which includes

the respiratory tracts infection diseases. Sixty four percent complained of foul smell in their work environment and 77.1% complained of backaches and headaches. Lastly 69.8% stated that they had experienced some effects of smoke fumes in their solid waste management practises.

Table 4.9 shows that most of the respondents identified dust as an occupation health hazard; this is partly because dust cuts across all the solid waste materials that were under investigation in this study mainly scrap metals, plastics, garbage and papers. The respondents also complained of both backaches and head aches and explained that this was because of their working environment. It is important to note that in all the categories the responses were very high and therefore it is evident that the waste collectors in solid waste management work in risky environment.

a) **Cuts from Waste Materials**

Table 4.10 shows the relationship between cuts received from waste and the various types of waste materials that the waste collectors collect.

Cuts%	Type of Waste				Total
	Scrap	Plastics	Garbage	Papers	
Yes	96.4	54.2	76.5	41.9	68.2
No	3.6	45.8	23.5	58.1	31.8

Source: Field Data (2007)

Table 4. 10: Relationship between Cuts and Types of Waste Materials

In total 68.2% of the respondents had been injured by being cut by the waste materials. The study found out that 96.4% of the respondents dealing with scrap metal had the highest rate of injury followed by the garbage sector with 76.5%. The plastics and paper collectors had 54.2% and 41.9% respectively. It is important to note that most of the materials collected are not sorted out; the sorting is done by the individual collectors. Most of the papers collected may be stapled together using staple pin and office pins and when the individual collectors are sorting them out they are pricked by this pins which harms them and therefore explains why the papers have a 41.2 % in this category.

b) Dust from waste materials

The study also established that during long dry periods the surface of open municipal dumping grounds becomes dry and very dusty. The waste pickers are exposed to air borne dust which makes their working conditions all the more unpleasant. Under these conditions the solid waste actors become susceptible to various allergic disorders like the respiratory tract infections.

Dust%	Type of Waste				Total
	Scrap	Plastics	Garbage	Papers	
Yes	92.7	90.3	88.2	96.8	91.7
No	7.3	9.7	11.8	3.2	8.3

Source: Field Data (2007)

Table 4. 11: Relationship between Dust and Types of Waste Materials

Table 4.11 shows that about 91.7% of the respondents had been affected by the dust from the materials they collected and from the analysis of the interview schedules the papers had the highest level of dust at 96.8% followed by scrap metals at 92.7%, then plastics at 90.3% and lastly the garbage at 88.2%. The study therefore found out that the emission of dust by the waste products is high and therefore exposes the waste collectors to harmful working conditions. Garbage is classified to be of two types which include the organic materials which are biodegradable but when dry can emit dust for instance animal manure. The second category includes the inorganic materials like debris from buildings which releases a lot of dust to the environment

c) Foul Smell from Solid Waste Materials

In most dumpsites the air is rank with the smell of rotting garbage that are clearly visible in the early mornings and on cold days in the surrounding areas of the scattered waste.

Foul Smell%	Type of Waste				Total
	Scrap	Plastics	Garbage	Papers	
Yes	45.5	66.7	100	51.6	64.1
No	54.5	33.3	00	48.4	35.9

Source: Field Data (2007)

Table 4. 12: Relationship between Foul Smell and Type of Waste Materials

Table 4.12 shows that in this study 64.1% of the respondents affirmed that they experienced foul smell from the waste that they collect. The interview schedule analysis revealed that the garbage produced a 100% foul smell followed by the plastics with 66.7%. The papers had 51.6% while the scrap metals produced the least smell at 45.5%. The foul smell emanates from the environment and necessarily no from the waste collected for instance the scrap metal might not produce the smell but the air in the site itself due to other wastes might be filled with the foul smell.

d) Smoke from Solid Waste Materials

Burning of waste materials in the dumping sites is a common phenomenon. Indiscriminate burning of waste leads to smoke fumes that are a mixture of many compounds and chemicals.

Smoke%	Type of Waste				Total
	Scrap	Plastics	Garbage	Papers	
Yes	50.9	76.4	88.2	76.4	69.8
No	49.1	23.6	11.8	30.2	30.2

Source: Field Data (2007)

Table 4. 13: Relationship between Smoke and Type of Waste Materials

Table 4.13 shows that 69.8% of the respondents claimed that they had worked in an environment characterized by smoke fumes. Garbage collection was the highest with 88.2% followed by plastics at 76.4%. Responses from paper collection had 69.8% complains and the scrap metal was the least with 50.9%. Most of the waste collected from homes or offices is dumped at the dumpsites; these dumpsites have a distinctive fire burning and therefore explain why garbage has a high response compared to the rest.

e) Aches from Solid Waste Management

Headache are a resultant of the noise in the environment and working long hours directly under the sun while backaches mostly result from carrying heavy luggage's or crouching for long hours in search of saleable items.

Back/Head Aches %	Type of Waste				Total
	Scrap	Plastics	Garbage	Papers	
Yes	72.7	76.4	94.1	67.7	77.7
No	27.3	23.6	5.9	32.3	22.3

Source: Field Data (2007)

Table 4. 14: Relationship between Aches and Type of Waste Materials

From the data analysis Table 4.14 shows that 77.7% of the respondents claimed that they had experienced some aches from their work; some stated that they experienced backaches, while others had some headaches. In the analysis of the interview schedules, garbage collectors had 94%, followed by plastic collectors at 76% and scrap metal collectors at 72%, paper collectors had the least experience of aches at 68%.

The study established that in almost all the categories over 50% of the respondents complained of the effects of the various indicators of hazardous waste materials that were detrimental to their health which is a human asset of paramount importance. Garbage collectors had the highest complains in aches, foul smell and smoke while the paper collectors were high in dust emission and the scrap metal collectors complained the most about cuts.

Most of the emissions can induce oduor sensations. Health complaints associated with oduorous emissions from dumpsites include eye, nose and throat irritation, headache, nausea, diarrhoea, hoarseness, sore throat, cough, chest tightness, nasal congestion, heart palpitations, shortness of breath, stress, drowsiness and alterations in mood. However further studies are necessary to quantify the specific levels of components in complex mixtures oduors that induce specific health symptoms.

4.1.6.1 Safety Precaution

Empowerment means enhancing an individual's capacity to make choices and translate these choices into preferred actions and outcomes. The transformation of these choices into the desired actions is influenced by the factors and the opportunities available. The study has established that the solid waste management process exposes the waste collectors to risky and hazardous environment. Therefore the actors in the sector need to be empowered to make rational decisions to take precautionary measures. However Table 4.11 shows that majority of those working in the sector do not use any protective garments or equipment. Gloves are envisaged as a safety precaution meant to protect the hands from cuts and other hazardous materials like lead fro leaking batteries. Overall are seen to protect the body from injuries and spillovers from waste materials because of its hard garment compared to the normal clothing. Safety boots are envisioned to protect the feet from cuts emanating from broken glasses, timber, metals and other harmful substance and lastly inhaler masks prevent the body from inhaling poisonous substances in the air that might have some negative effect to the body metabolism. It is worth noting that there are many precautionary measures that can be undertaken in this sector however this study only enquired on these listed basic precautionary measures. Table 4.15 show the respondents adherence to safety measures based on the type of waste they collect.

Safety Precautions	Gloves %		Overalls %		Safety Boots %		Inhaler Masks %	
Waste Types	Yes	No	Yes	No	Yes	No	Yes	No
Scrap Metals	40	60	34.5	65.5	23.6	76.4	30.9	69.1
Plastics	20.8	79.2	26.4	73.6	11.1	88.9	18.1	81.9
Garbage	50	50	35.3	64.7	41.2	58.8	47.1	52.9
Papers	29	71	32.3	67.7	12.9	87.1	35.5	64.5
Total %	**32.8**	**67.2**	**31.3**	**68.7**	**20.3**	**79.7**	**29.7**	**70.3**

Source: Field Data (2007)

Table 4. 15: Respondents Frequency on Adherence to Safety Precaution Measures

The table shows that 67.2% of the respondents did not use any gloves to protect their hands from the waste. Fifty percent of those dealing with garbage collection stated that they were using the gloves to protect their hands, followed by 40% of the scrap metal collectors, 29% of

the waste paper collectors and 21% of the plastic collectors. This shows why most of the respondents were complaining of having been cut in their search for saleable items.

Majority (68.7%) of the respondents stated that they have not used any overalls in their work. In the scrap metal category only 34.5% of the respondents had used overall as a safety measure, 26.4% of the plastic metal collectors, 35.3% of the garbage collectors and 32.3% of the paper collectors stated that they were using overalls as protective clothing in their work. This shows that the solid waste workers are not enlightened on their safety and there is a need to change their attitudes toward overalls as safety precautions.

In the analysis of interview schedules it was established that 79.7% of the respondents were not using gumboots or safety boots as safety measures, 88.9% of the plastic collectors, 87.1% of the paper collectors, 76.4% of the scrap metal collectors and 58.8% of the garbage collector stated that they were not using any protective boots for their feet. Due to the nature of the materials involved adoption of using safety boots is perceived in this study as very high in the garbage category followed by scrap metals which are very risky. The papers and plastics are less risky and therefore usage of safety boots is very limited.

The table also shows that 70.3% of the respondents stated that they did not use the inhaler masks in their duties as a safety precaution, 81.9% of the plastic collector, 69.1% of scrap metal collectors, 64.5% of paper collectors and 52.9% of the garbage collectors did not use the inhaler mask in their work. Lack of adequate knowledge and the cost implication of the inhaler masks can be cited as the reason for low usage of the mask.

4.1.6.2 Relationship between Safety Precaution and Income

Income is an important determinant on whether the waste collector will use preventive measures in solid waste management. The study established that there exists some relationship between income generated from solid waste management and how the waste collectors take precautions on the safety of their working environment. Table 4.16 shows the relationship between income and safety precaution measures

Respondents income(Ksh) /Month	Gloves %		Overalls %		Safety Boots %		Inhaler Masks %	
	Yes	No	Yes	No	Yes	No	Yes	No
below 5000	23 (12.0%)	102 (53.1%)	24 (12.5%)	101 (52.6%)	13 (6.8%)	112 (58.3%)	19 (9.9%)	106 (55.2%)
5001 - 10000	12 (6.3%)	13 (6.8%)	9 (4.7%)	16 (8.3%)	9 (4.7%)	16 (8.3%)	10 (5.2%)	15 (7.8%)
above 10000	28 (14.6%)	14 (7.3%)	27 (14.1)	15 (7.8%)	17 (8.9%)	25 (13.0%)	28 (14.6%)	14 (7.3%)
Total %	63 (32.8%)	129 (67.2%)	60 (31.3%)	132 (68.8%)	39 (20.3%)	153 (79.7%)	57 (29.7%)	135 (70.3%)

Source: Field Data (2007)

Table 4. 16: Relationship between Income and Safety Measures

The table shows that of the 32.8% respondents who were using gloves, 12% were earning less than Ksh. 5000 per month followed by 6.3% earning between Ksh. 5001 – 10000 per month and 14.6% were earning over Ksh. 10000 per month. This shows that majority of those earning above Ksh. 10000 were using gloves while there was a slight balance in the respondents earning Ksh. 5001 to 10000 and the majority of those earning less than 5000 were not using gloves as a safety measure.

From the table majority (14.1%) of those whose income had exceeded ksh. 10000 were using overalls as a safety measure while the majority (52.6%) of those whose income was less than Ksh. 5000 per month were not wearing overalls as well as 8.3% of the respondents whose income was between Ksh. 5001- 10000 hence we can conclude that usage of overall as a safety measure is depended on the income derived in solid waste management.

The table shows that in all categories of income majority of the responses were not using safety boots as a precautionary measure. Only 20.3% of the respondents considered safety boots as necessary in a safe working environment. This shows that safety boots among the

individual waste collectors are not highly regarded as necessary assets in solid waste management and this is partly attributed to the high cost of the safety boots.

The table also highlights that 29.7% of the respondents were using inhaler masks in their livelihoods attainment. In the categories of respondents exceeding an income of Ksh. 10000 most of the waste collectors were using inhaler masks while in the category of less than Ksh. 5000, inhaler masks were least used.

In this section less than a third of the respondents in all the categories of income were using safety precaution measures. In the use of inhaler masks, overalls and gloves, the respondents whose income was above Ksh. 10000 were more than those who were not taking any safety measure. However in all the listed safety measures majority of the respondents were not using any safety measure and therefore it is evident that income has a relationship with adoption of safety measures and the higher the income the more likely the waste collectors will take safety precautions.

4.1.6.3 Relationship between Safety Precaution and Education

Education is an important human asset which enables an individual to make rational choices. This refers to the knowledge, skills and ability to work. Conversely human capital is also dependent on health care and safe environmental conditions. Therefore for continuance earning the individual worker must take the necessary safety precautions and must make lucid decisions about their health which is an important asset to them. Table 4.17 shows how education was found to be influencing the decisions of the waste collectors in solid waste management on undertaking precaution measures.

Level of Education	Gloves %		Overalls %		Safety Boots %		Inhaler Masks %	
	Yes	No	Yes	No	Yes	No	Yes	No
did not attend school	1 (0.5%)	8 (4.2%)	1 (0.5%)	8 (4.2%)	1 (0.5%)	8 (4.2%)	2 (1.0%)	7 (3.6%)
primary school	29 (15.1%)	90 (46.9%)	33 (17.2%)	86 (44.8%)	23 (12.0%)	96 (50.0%)	24 (12.5%)	95 (49.5%)
secondary school	29 (15.1%)	30 (15.6%)	23 (12.0%)	36 (18.8%)	12 (6.3%)	47 (24.5%)	28 (14.6%)	31 (16.1%)
Tertiary level	4 (2.1%)	1 (0.5%)	3 (1.6%)	2 (1.0%)	3 (1.6%)	2 (1.0%)	3 (1.6%)	2 (1.0%)
Total %	63 (32.8%)	129 (67.2%)	60 (31.2%)	132 (68.8%)	39 (20.3%)	153 (79.7%)	57 (29.7%)	135 (70.3%)

Source: Field Data (2007)

Table 4. 17: Relationship between Level of Education and Safety Measures

The table shows that as the education level progressed so did the respondents use of gloves as a safety precaution for instance the ratio of those who did not go to school is (1:8), primary school (1:3), Secondary school (1:1) and tertiary institutions (4:1). And therefore the study established that the usage of glove as a safety measure is highly dependent on the level of education. The study also established that adoption to the use of overalls as a safety measure is depend on the level of education of the respondents this was based on the analysis of the ratio between those using the overalls against those who were not using it. The following results were obtained; those who did not go to school (1:8), primary school (1:2.6), secondary school (1:1.6) and lastly tertiary institutions (1:0.6). Therefore the lower the level of education the more the waste collectors were resistance to the use of overall as protective garments.

On the relationship between safety boots and education level the following results were obtained; those who did not attend school (1:8), primary school (1:4.2), secondary school (1:3.9) and tertiary institutions (1:0.6). Though the progression from primary school to secondary school on the usage of safety boots as protective shoes is minimal the overall results show that education is a determinant on the use safety boots as a protective measure.

The results on the use of inhaler masks and level of education shows that; for those who did not go to school the ratio was (1:3.5), primary school (1:3.9), secondary school (1:1.1) and tertiary institutions (1:0.6). The results show a regression from the category of those who did not go to school and primary education however the total response of those who have not attended school compared to those in primary school is 9 to 119 and therefore these results can be attributed to the "tyranny of Numbers". In the secondary and tertiary institutions there is a progression and therefore the results suggest that the use of inhaler masks increased with the increase on the level of education.

4.1.7 Strategies of S W M used by Waste Collectors in Nakuru Municipality

The strategies used by the individual workers in solid waste management have an outcome on their livelihoods. The strategy used is dependent on the availability of the waste materials and the value attached to the waste end product. Reuse of waste has great recovery potential and reduces substantially the amount of waste to be disposed. Recycling as a strategy provides employment opportunities and cheap products while composting has some environmental benefits. Generally all the three strategies reduce substantial amounts of waste to be disposed from the municipality. However it is important to note that the respondents collected the recyclables and reusable materials and sold them to other individuals who had use for them. Those engaged in composting sold their compost product or were paid to do the composting. Some individuals were involved in more than one strategy in an effort to maximize on their income. Table 4.18 shows the three strategies commonly used in Nakuru municipality by the waste collector in solid waste management.

Strategies of SWM	Recycling Frequency	Reuse Frequency	Composting Frequency	Disposal/Burning Frequency
Yes	157 (81.8%)	56 (29.2%)	11 (5.7%)	23 (12%)
No	35 (8.2%)	136 (70.8%)	181 (94.3 %)	169 (88%)

Source: Field Data (2007)

Table 4. 18: Nakuru Municipality SWM Strategies

It can be deduced from Table 4.18 that recycling was the most preferred strategy of solid waste management by the waste collectors at 81.8% followed by reuse and composting at 29.2% and 5.7% respectively. Refuse disposal (12%) and or burning is a strategy that was used by individuals who collected from households and disposed the waste to designated dumpsites within the neighbourhoods. A lot of ascription to recycling can be attributed to the fact that there are a number of individuals who have established themselves within the municipality and are able to collect the waste materials and transport them to Nairobi for recycling. Therefore the waste collectors are assured of ready market for their products.

4.1.7.1 Strategy for recycling

Table 4.19 shows the relationship between the types of waste that the waste collectors collect and the recycling strategy they use to earn income in solid waste management within Nakuru municipality.

		Type of Waste Collected				
		Scrap Metal	**Plastics**	**Garbage**	**Papers**	**Total**
	Yes	55	72	8	30	165
		33.3%	43.6%	4.8%	18.2%	85.9%
	No	0	0	26	1	27
		0%	0%	96.3%	3.7%	14.1%
Total		**55**	**72**	**34**	**31**	**192**
		28.6%	**37.5%**	**17.7%**	**16.1%**	**100%**

Source: Field Data (2007)

Table 4. 19: Relationships between the Type of Waste Collected and Recycling

The table shows that all the solid waste collectors collecting scrap metals (33.3%) and plastics (43.6%) were selling their commodities for recycling. Almost all the paper collectors (18.2%) were collecting the papers for recycling, however due to the organic nature of the garbage they are not recyclable and therefore could not be used for this strategy. It is important to note that some organic waste like banana peel potatoes peels and vegetables can be used as animal feeds after some processing.

4.1.7.2 Strategy for re use

Table 4.20 shows the relationship between the types of waste that the waste collectors collect and the reuse strategy that they use to earn income in solid waste management within the municipality.

		Type of Waste Collected				
		Scrap Metal	**Plastics**	**Garbage**	**Papers**	**Total**
	Yes	15	31	10	10	66
		22.7%	47.0%	15.2%	15.2%	34.4%
	No	40	41	24	21	126
		31.7%	32.5%	19.0%	16.7%	65.6%
Total		**55**	**72**	**34**	**31**	**192**
		28.6%	**37.5%**	**17.7%**	**16.1%**	**100%**

Source: Field Data (2007)

Table 4. 20: Relationships between the Type of Waste Collected and Reuse

The study established that 22.7% of the scrap metal dealers and 47.0% of the plastic collector were collecting some of their waste for reusing. Some of the scrap metals were reused for other purposes like providing cheap raw materials to the *jua kali* sector while the plastics were used as flower vases and water cans. The table also shows that 15.2% of the paper collectors were collecting the papers for reuse.

4.1.7.3 Strategy for Composting

The findings of Table 4.21 shows the relationship between the types of waste that the waste collectors collect and the composting strategy that they utilize to earn an income in the sector

		Type of Waste Collected				
		Scrap Metal	**Plastics**	**Garbage**	**Papers**	**Total**
	Yes	0	0	11	0	11
		0%	0%	5.7%	0%	5.7%
	No	55	72	23	31	181
		28.6%	37.5%	12.0%	16.1%	94.3%
Total		**55**	**72**	**34**	**31**	**192**
		28.6%	**37.5%**	**17.7%**	**16.1%**	**100%**

Source: Field Data (2007)

Table 4. 21: Relationships between the Type of Waste Collected and Composting

The table shows that 5.7% of the respondents dealing with garbage collections have been collecting their solid waste for composting compared to 12.0% who were collecting garbage for either disposal or burning them in dumpsite. This can be explained by the fact that most people lack the technical know how of composting. It can also be attributed to the fact that composting produces a foul smell and most people would not be comfortable with.

The study undertook a case study of a group of waste collectors who had come together to try and earn a living from composting as a solid waste management method within the municipality. This waste collectors came together to benefit collectively from the municipal dumpsite and formed a local community based organisation called the Menengai Waste Recycling Management (MEWAREMA) which mainly composts waste to form organic fertilizers. Box 4.2 shows the activity of this group and how the members have collectively and individually benefited from composting as a solid waste management strategy.

Box 4. 2: Composting: A case study of MEWAREMA

Some individuals have come together to form composting groups for economic empowerment, one such group is the Menengai Waste Recycling Management (MEWAREMA) which is located at the municipal dumping site (Plate 4.8) and comprise of 40 members, ten of whom are men. The group's main objective is to turn waste into wealth, clean the environment and change the life of its members both socially and spiritually. Initially most of the members were waste collectors in the municipal dumpsite; the youngest member in the group is 21 years while the oldest is 82 years.



Source: Field Photos (2007)

Plate 4. 8: MEWAREMA Compost Unit at the Municipal Dumping Site

The group was started in the year 2000 after a memorandum of understanding between the group, M.C. N., Egerton University, Nairobi University and the National Environment Management Agency to clean the environment and reduce pollution which was rampant as a result of the non biodegradable polythene papers. The group has also received assistance from the Intermediate Technology Development Group, MCN and the constituency Development Funds in meeting its objective. The group prepares compost manure from the waste dumped in the site and sells the final product at a rate of 6 to 10 shillings per kilogram. The group also has a one acre piece of land where they are planting trees to counter environmental pollution. Plate 4.9 shows members planting tress in their piece of land to counter environmental pollution while Plate 4.10 shows an existing manmade forest planted by the members of the group within the municipal dumpsite.



Source: Field Photos (2007)

Plate 4. 9: MEWAREMA Group Members Planting Trees



Source: Field Photos (2007)

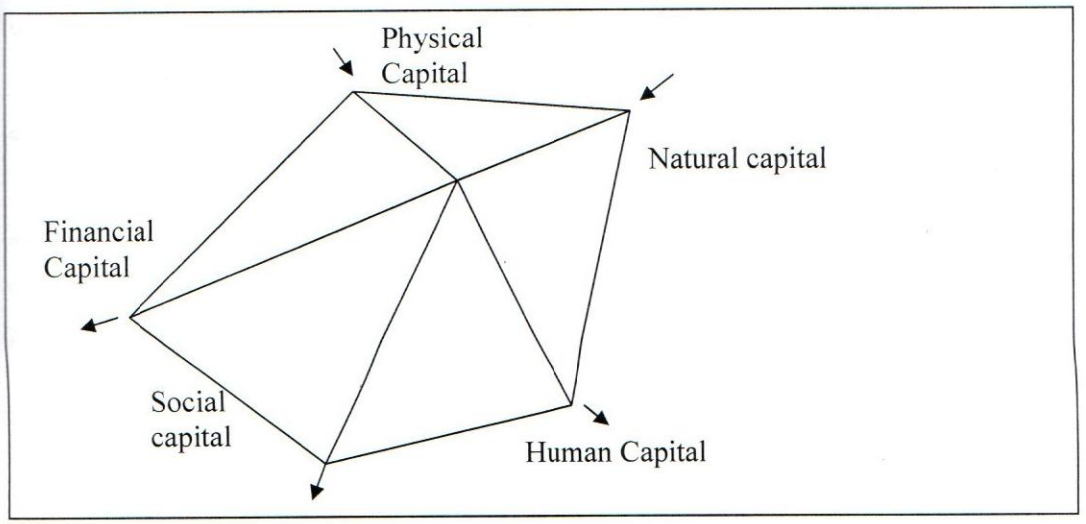
Plate 4. 10: Artificial Man Made Forest at the Municipal Dumping Site

The group stresses that the biggest problem that they face is marketing of their products and low prices. This has not adequately provided for the needs of the members as a source of livelihood. Therefore the members have resulted to other alternatives of income generation like sweeping and user pay strategies where the waste users pay a fee for their waste to be collected.

4.1.8 Vulnerability Context and Individual Assets in Solid Waste Management

4.1.8.1 Individual Assets in Solid Waste Management

The study found out that there are several assets as conceptualized in the framework that were determining the outcomes of the livelihoods of the waste collectors in solid waste management. Figure 4.4 shows how the various assets in solid waste management were combining to produce the outcomes.



Source: Field Data (2007)

Figure 4. 4: Assets Pentagon in SWM

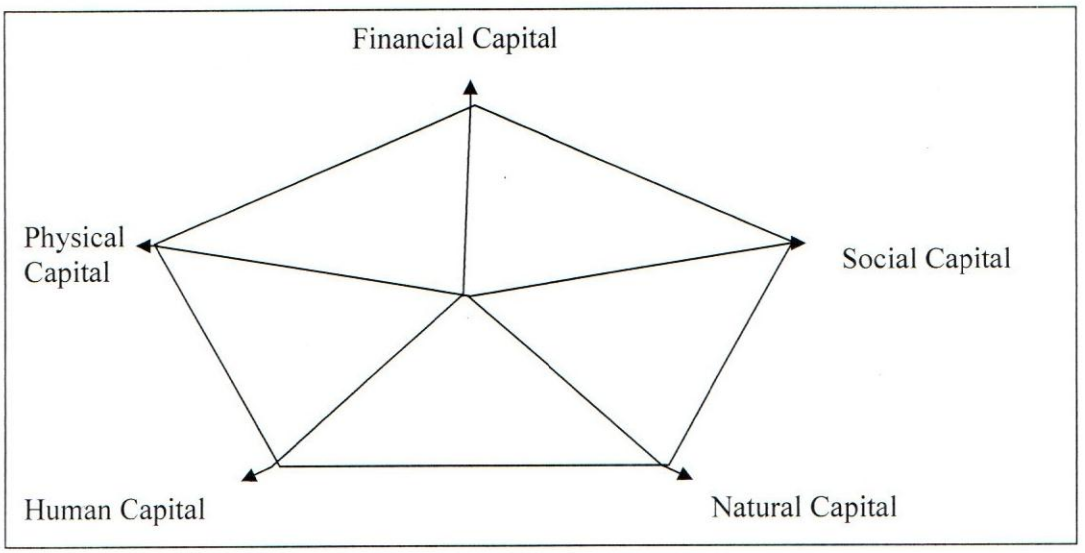
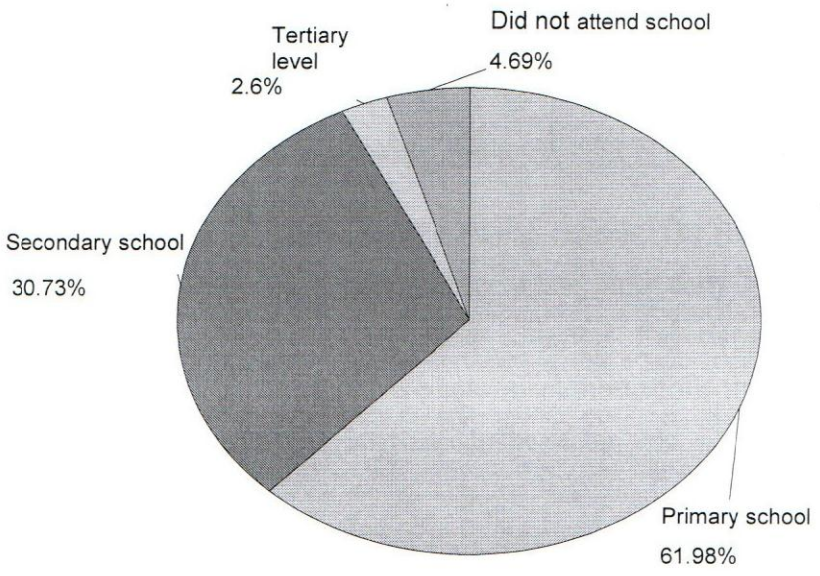


Figure 4. 5: Assets Pentagon

Figure 4.4 shows a decline in access to physical and natural capitals as shown by the inward arrows while there is a stable increase in the financial, social and human assets as shown by the outward arrows. The shorter the line from the mid point shows the decline while the longer the line shows an increase in assets as compared with Figure 4.5 which shows an increase in livelihood assets where all the assets are equal. Below is a synopsis of the findings of this study in relation to the assets that a waste collector poses. However, it is important to note that in practice not all assets can be possessed or entirely controlled by the individuals who are endeavoring to use them in their livelihood strategies.

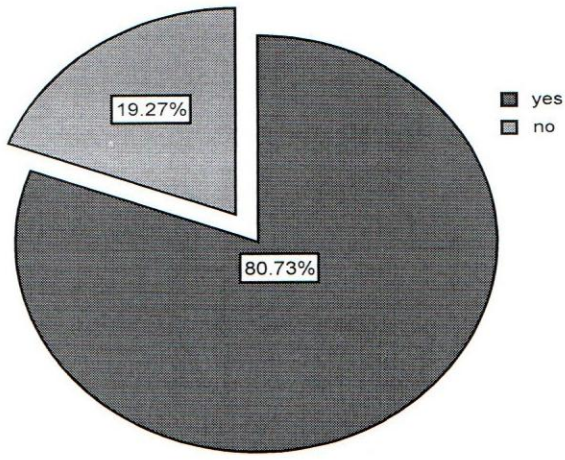
a) Human Capitals

This includes skill, knowledge, ability to labour and good health. Financial capital in terms of access to work and income is dependent on adequate human capital Figure 4.6 shows that only 4.7% of the respondents had not acquired any formal education. On the other hand human capital is also dependent on adequate health care and safe environmental conditions.



Source: Field Data (2007)

Figure 4. 6: Human Assets (Education Level)



Source: Field Data (2007)

Figure 4. 7: Human Assets (Perceived Health Hazards)

Figure 4.7 shows that most of the waste collectors work in an environment that jeopardizes their health which may affect their human capital due to the loss of working hours. But there are a number of health facilities within the municipality which can offer cheap medication for the ailment suffered. Though healthcare is reasonably available it is at a cost and there is likely hood for access to differ from one waste collector to the next.

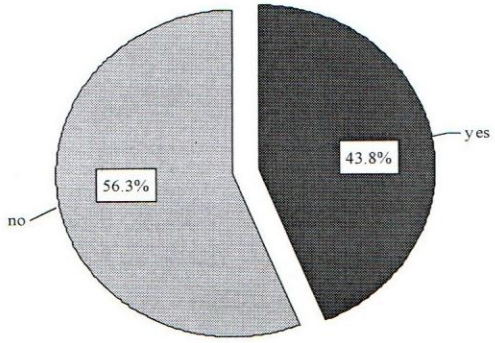
The ability to offer labour is a part of the human capitals. The study established that majority of the waste collectors are able to collect waste on a daily basis. Therefore there is a consistency in labour supply by the waste collectors. Experience is an important facet of labour and due to lack of alternative employment most of the respondents have grown with the job and therefore have vast experience in the sector.

b) Natural Capital

This includes the lands, water, biodiversity as well as the services derived from them. It also includes the common property resources which have communal management. Some of the common pool resources available to the waste collectors include the municipal dumpsite where most of the waste collectors can access. The various dumpsites designated in the municipality like in Free area, Langa langa and Kaptembwo are also examples of common pool resources.

c) Social Capital

This includes networks, groups, trusts, mutual understanding, shared values and access to institutions which people utilize to access for example loans, information and even employment opportunities. In terms of trust the study in Figure 4.8 observed that 43.8% of the respondents were harassed by the residents in areas that they scavenge for solid waste and in some cases they have been accused of stealing from them. In the eyes of the society most of them claimed that they are seen as vagabonds and could therefore not be trusted.



Source: Field Data (2007)

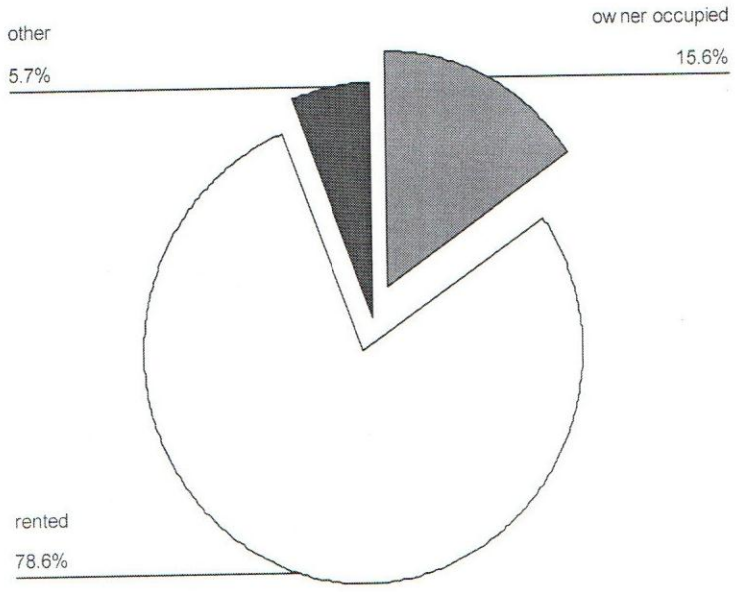
Figure 4. 8: Harassment by Residents

The study also established that mutual trust exists between the waste collector and waste buyers. Majority of the waste collectors collect their waste materials and sell them to individual buyers who in turn sell them in bulk thus forming a network of reciprocity amongst the waste collectors in the sector. As exemplified by the MEWAREMA and NAWACOM groups of waste collectors who have come together to form networks of association and benefit both individually and collectively.

Some individual collectors especially most waste paper recyclers have developed some mutual understanding with small organizations especially the photocopy bureaus where they go and collect the waste papers daily and sell them to recyclers. This also is repeated by the scrap metal collectors where by they have developed some trusts with garage owners who in turn sell them the scrap metals when available and thus reducing the final waste that is disposed.

d) Physical Capital

This includes assets such as housing, tools and equipment that people own, rent or use and public infrastructure that they can access. The municipal dumpsite is an example of physical infrastructure that waste collectors scavenge for solid waste materials. The local authority in conjunction with other stakeholders has designated some dumpsite in the estates which are meant to be emptied by the municipal council. The municipal council has 3 working trucks (April 2008) which is used to collect and transport solid waste and dispose it at the municipal dumping site



Source: Field Data (2007)

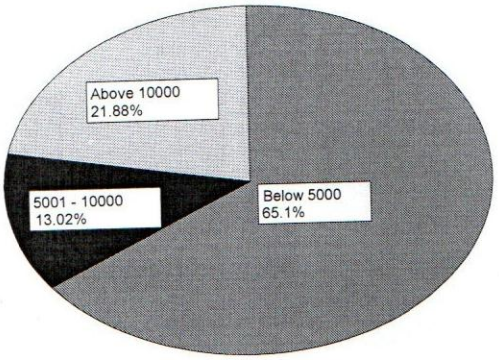
Figure 4. 9: Respondent's Residential Status

Figure 4.9 shows the residential status of the waste collectors which form the physical capital. The study found out that 78.6% of the respondents live on rented houses within the municipality while 15.6% live on owner occupied houses. The study established that 5.7% of the respondents live on small houses built next to the municipal dumping site in the municipality and therefore could not qualify to be owner occupied houses but never the less form part of the physical capital that the waste collectors posses.

The study also established that a few individuals in the sector use some safety precaution garments like gloves, overalls, safety boots and inhaler masks which aid them in performing their duties. The MEWAREMA man made forest and the NAWACOM paper shredders highlights some of the physical capitals owned by the waste collectors that help them in attaining their livelihoods

e) Financial Capital

This includes income, savings, credits and pensions. Income from the sale of labour is the most important financial asset for the waste collectors and which is given more priority. This is due to the highly commoditized nature of urban life leading to escalated dependence on cash. The study as shown in Figure 4.10 established that the waste collectors in solid waste management earn some income depending on the level of education, type of waste collected and the strategy used.



Source: Field Data (2007)

Figure 4. 10: Individual's Income from SWM

Though credit may be a key asset for the waste collectors, many individuals were unable to access credit through the formal market but a few individuals reported to be able access credit through the informal sector mainly the merry- go while financial capital is one of the most important assets for the waste collectors, it is also one of the most problematic as it has

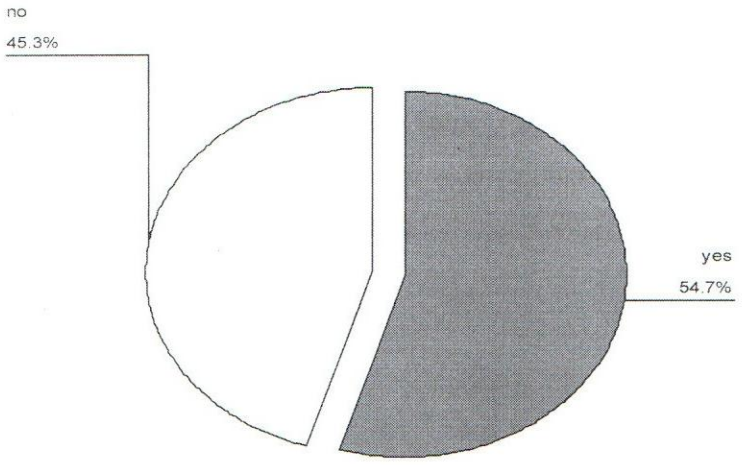
barriers that constrain the waste collectors to accessing credit for further development due to their meager income.

4.1.8.2 Vulnerability Context in SWM

The capitals which the waste collectors posses or have access to, the livelihoods they desire and the strategies they adopt are influenced by the context of their environment. Vulnerability can be understood from the context of insecurity or well being of individuals or communities in the face of changing environment. The extent of vulnerability relates both to level of external threat to household's welfare and to their resilience resisting and recovering from these external threats. Some of the vulnerability context which encompass the individual external environment observed in this study include:-

a) Unemployment

Due to retrenchment, rural urban migration and low income, the waste collectors have become vulnerable due to diminishing employment opportunities however their resilience as this study established has been shown by their indulgence in the solid waste management sector and their ability to cope and earn income from the sector.

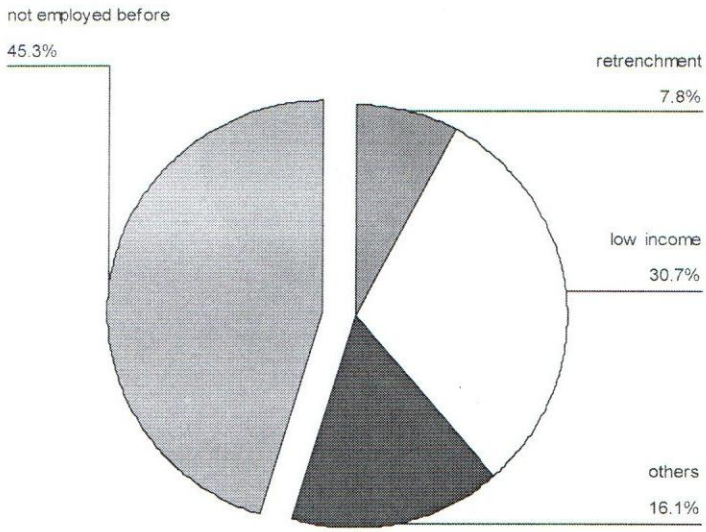


Source: Field Data (2007)

Figure 4. 11: Respondent's Employment Record

The study found out that 54.7% of the respondents had previously been employed while 45.3% were in solid waste management as their first job as shown in figure 4.11. This shows

that because of the high rates of unemployment most people end up looking for alternative jobs which include solid waste management.



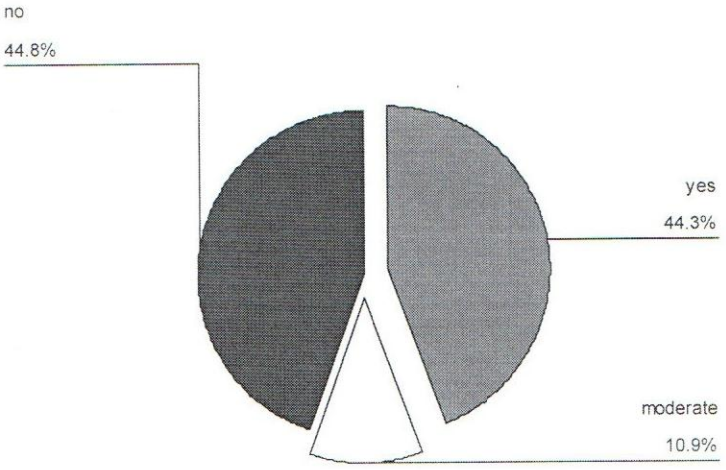
Source: Field Data (2007)

Figure 4. 12: Reasons for leaving Previous Employment

Figure 4.12 shows that 7.8% of the individual waste collectors who had previously been employed were retrenched from their jobs while 30.7% opted out due to low incomes while 16.1% were either sacked or were in contracts and in some cases the job just ended, that means that they were casual labourers.

b) Job Security

Urban economies are characterized by a greater degree of commercialization and most of the basic amenities in life must be bought. Therefore the waste collectors need income flow for them to survive and therefore their job security is of paramount importance for them to make a living in the urban areas.



Source: Field Data (2007

Figure 4. 13: Respondent's Job Satisfaction

The study found out that only 44.3% of the respondents claimed to be satisfied with the job that they were doing while the majority 44.8% was not satisfied. Figure 4.13 shows that 10.9% were neither satisfied nor unsatisfied. Job security is a point of vulnerability in solid waste management and only those that are happy with the work that they are doing can feel secure.

Job insecurity is thus a source of vulnerability to the waste collectors however dependence on income means that the waste collectors must survive through undertaking a variety of informal income generating activities and this explains why the waste collectors do not specialize on one type of waste.

As noted above (section 4.1.8) the waste collectors working in the informal sector, normally work without protection and are vulnerable to accidents in the work place and the health hazards associated with unsafe working environment and practices. The waste collectors suffer from diseases and injuries resulting from proximity to toxic, harmful waste and pollution. This health hazards have both a cost and temporal effect to the waste collectors in that treating the ailments eats on the savings while going to seek for medication takes on the time that would have been used to earn income.

The relationship of the waste collectors to the municipality usually depends on their legal status which also makes them vulnerable. Many waste collectors work in informal and unregistered activities which by law are illegal and therefore not known or acknowledged by the municipal authority. Lack of legal status limits the waste collectors from accessing basic social services like health through the National Hospital Insurance Fund, financial services like loans and pension through the National Social Security Fund.

4.2 Discussion

Nakuru municipality was once rated as the cleanest town in East Africa, but due to the urban sprawl, the quality of life has rapidly been deteriorating with adverse effect to the waste collectors who have lacked access to basic amenities which should be provided by the Municipal Council. Whereas the municipal experiences a population growth rate of 5.6% per annum, the infrastructural development has either stagnated or grown at a very minimal rate. It has therefore become increasingly necessary to find efficient waste management systems to try and minimize waste generated in the municipality. This has resulted to the waste collectors utilizing this opportunities to earn a livelihood as a result of lack of alternative employment.

However, efforts are being made to reclaim its lost glory, through a partnership project that operates under the banner "Together for a cleaner Nakuru". Through various events and activities that create a wider and an effective awareness among the residents of Nakuru about environmental issues, Practical Action (East Africa) is developing plans to redress the situation, in close partnership with the Municipal Council of Nakuru, Nakuru Business Association and the National Environment Management Authority.

This study established that the respondents collected wastes as they had no alternative but to do so as it was their only source of livelihood. This is well explained by the increased population growth rate which has resulted from the in-migration from the other parts of the country. This is because of the town's relative centrality and accessibility from all parts of the country. It's cosmopolitan character, good climate, relatively low cost of living and availability of various services among other attractions has also played a role. In the recent past, the town has experienced increased population growth due to the infamous tribal clashes in Molo, Likia and Njoro areas between April 1992, and March 1998. This has caused the

growth of Nakuru's population labour force structure, which accounts for high labour force growth rate in the town and thus the proliferation of the informal sector.

It should be noted that only a fraction of the labour force is actually employed. This implies that there is a high dependency ratio, increasing unemployment and, urban poverty. This therefore forces the waste collectors to look for alternative employment in SWM. These findings are comparable to a research conducted by Sarkar (2003) in Delhi India where it was revealed that 85% of the respondents collected waste on a daily basis as a source of livelihood.

4.2.1 Income Generation from Solid Waste Management

In this study majority of the informal waste collectors earn less than 5000 Kenyan shilling per month this can be explained by the fact that as a source of livelihood and due to lack of alternative employment, a lot of the waste collectors have ventured into the sector and therefore scavenging for saleable items is competitive. The findings of this study compares to a study conducted in Delhi where an adult waste pickers earn a meager Rupees 45 to 80 per day (Sarkar, 2003) which translates to about Ksh.4000/= per month. From the NAWACOM experience where waste material is bought as low as 3 shillings per kilo it is evident that the informal actors would only earn less money at the end of the day bearing in mind that the scrap metal are heavy while plastics and papers are bulky and therefore the waste collectors carry only a few Kilos. The study established that there is a relationship between income and type of waste collected. Scrap metal dealers and plastic dealers were earning more income because this kind of waste are easily available and they also tend to have a ready market and they are also easily reused and recycled.

The findings of this study further suggest that there is a lot of exploitation by the few individuals who can afford to buy the materials in large quantities and dictate the market prices. In fact Baud and Post (2003) assert that in Nairobi only one large-scale company buys any given material, thus gaining a monopoly which leads to large fluctuations in prices and demand for waste materials in Kenya. Since most of the waste collectors do not have a legal framework they therefore lack labour rights and cannot arbitrate for better terms of service. Though Solid Waste Management by the waste collectors supports livelihoods through subsistence, education and property acquirement it is evident from this study that majority of the poor waste collectors are susceptible to exploitation by the wealthy individuals acting in

the same field. Lack of education and alternative employment has led to the majority of the actors in this sector collecting waste as a survival strategy.

In this study majority of the respondents who earn less than 5000 shillings were below the age of 35 years this implies that age factor is important in income generation in that the actors are in the process of developing networks of reciprocity which would guide them in their business endeavour's and which will connect them to one another and benefit from this associations and hence as age increases so does the income. This can also be understood from the point of limited capital base as these informal actors are in their formative stages in their entrepreneurship skills and have therefore not been able to lay strategies of reciprocal income earning. This is emphasized by the fact that most of the young people have chosen Nakuru due to its low living standards or have been driven to the town by the ethnic clashes, and therefore it would be the ideal place to settle.

This study lays emphasis on the sustainable livelihood framework as its conceptual framework. Social capital is an important facet in this study as the role of individual and collective action and the relationship between the two are important concept in resource management. There is a tacit assumption that collective action is more effective, just and appropriate than individual action (Berkes, 1989). These individual actions can increase inequalities within communities. The findings of this study justify this argument in that where there are no networks of associations and norms of reciprocity the informal sector becomes individualistic and they are exploited by the few rich individuals who have developed the networks and can be able to transport their cheaply bought waste materials to Nairobi and therefore at the behest of a few waste collectors the majority of the actors only earn a meager Ksh. 5000 shillings per month.

The study has established that there is a significant relationship between the income earned and the type of residence that the waste collectors reside in, however majority of the respondents live in rented houses while only a sizeable number live in owner occupied residential houses. This is due to the meager income that most of the respondents earn. The land prices have also been on the rise in the municipality which has been occasioned by the rapidly increasing municipal population. According to the Nakuru Strategic Structural plan of 1999 (MCN, 1999) different land tenure types exist within the municipality, however, there hardly exist any stocks of land for urban development, and it is therefore unavailable for lease

to private developers. Most of it is already committed to various public purposes. This means that compulsory acquisition and voluntary sale/purchase present the only options for increasing the much-needed land for future development of public purposes and utilities. Private land readily available for urban development are generally more expensive this is because of the increase in demand and scarcity of the resource therefore most of the informal actor cannot afford the commodity which is left as a preserve of the few wealthy individuals.

The study found out that there were a high number of respondents who had dependants in school. This can be explained by the fact that when the National Alliance Rainbow Coalition (NARC) won the 2002 general election, free primary education was introduced and it became almost mandatory for parents to enroll their children in school. The municipality supports 53 public primary schools where two deal with special need children (MCN, 1999), that not withstanding the efforts of providing basic necessities like school uniform, lunch and basic life amenities solely remains the responsibility of the parent. Only a few of the respondents had gone beyond primary education; it is important to note that even after several years of waste picking they do not acquire any special skills and are hence unable to move into any other occupation. Trapped in the vicious cycle of poverty and debt they are forced to continue with waste picking as a source of livelihood (Sarkar, 2003) and as a survival strategy (Slater and Chasca, 2003). Therefore the only avenue available for them to escape from this quagmire is to support their children in school hoping that education will open the door to riches and good life. Education as conceptualized in this study is a Human asset and from the point of vulnerability of the respondents they have succeeded to input a valuable and sustainable asset to their children who in turn will have favourable livelihoods outcomes.

The study established that there were more men than women in this sector which contradicts Huysman (1994) who argues that women are greatly disadvantaged in the labour market and tend to predominate the waste picking sector, he justifies that women have low education levels compared to men and their child rearing and domestic responsibilities are reasons that decimate them in the formal sector. However, in this study that might not be the case since, of all the respondents interviewed only a few were women, this can be attributed to their child rearing and domestic chores. Geographically men are more mobile than women and can therefore be able to cover a bigger distance compared to women who in most of the time had children cuddling in their backs.

4.2.2 Occupational Health Hazards and Associated Risks

It is evident from this study that majority of the waste collectors in solid waste management in Nakuru municipality in an attempt to attain a livelihood work in conditions that subject them to high risks which are detrimental to their health.. This study concurs with Zamberia (2006) when he asserts that most of them do not take any health precaution. While undertaking their duties which constitute real safety hazards the waste collectors cannot afford adequate protective clothing or equipment and often, for purposes of speed, do not want to use them. This is exacerbated in the dumpsites and land fills where the working environment is extremely hostile and dangerous. The deposits at the landfill regularly comprise a mix of municipal as well as hospital and industrial waste which pose the greatest risks to the actors in Solid Waste Management. The study also found out that most of the hospital wastes are dumped in the Municipal dumping site in their raw form, that is they have not been incinerated as it is required by the Law; this therefore increases the chances of contaminating the waste pickers and therefore jeopardizing their health.

Improper handling of solid waste and indiscriminate disposal in open spaces, road margins, tank beds, and many other areas, give rise to numerous potential risks to the environment and to human health. Direct health risks mainly concern those working in the field without using proper gloves, uniforms, and safety boots. According to the Solid Waste Management Manual (2000) a high percentage of waste workers and individuals who live near or on disposal sites are infected with gastrointestinal parasites, worms, and related organisms. For the public, the main risks to health are indirect and related to poor water, land, and air quality. In addition, infrequent collection of waste provides an attractive breeding ground for flies and rats. The findings of this study are that the occupational health hazards of waste pickers arise from two aspects – poverty and their occupation itself. Since they belong to the poorest and most deprived section of the urban population, Sarkar (2003) asserts that under nutrition, growth retardation, anaemia, tuberculosis and other bacterial and parasitic diseases are very common amongst waste pickers. These make them more susceptible to occupational health hazards.

In anticipation of discovering some saleable item the waste pickers rummage through putrefying waste heaps including toxic medical waste using their bare hands and feet and hence come in direct contact with waste material. Infections and infestations results due to such contact with human and animal excreta, sputum, dead animals and potentially infectious

hospital waste dumped in refuse dumps this makes them highly susceptible to a number of health hazards especially in the municipal dumping site located in London as was found in this study. The findings of this study that solid waste workers work in inhume conditions and once in a while receive cutting from broken metals and glasses concurs with a study conducted by Sarkar (2003) and Furedy (1992). Most of the materials that find their way for disposal are not selected at the source and they comprise of broken glasses, pieces of metals, woods and many others. The waste collectors in their effort of eking a living rummage through waste and therefore end up being cut as was found in this study. Poverty is a factor that has hindered the actors in this sector from undertaking safety precautions. The meager income earned by waste pickers offers them a means of survival and cannot afford them the "luxury" of wearing protective clothing's like overalls, safety boots and hand gloves, as it is assumed that it will be taking another "plate of food off their table". However this can be blamed on the lack of proper education by the respondents because the costs incurred in treating the ailments is far much above the cost of buying this materials which are in fact a one time venture not forgetting the working hours lost during the process of seeking treatment. This phenomenon is also augmented by the fact that there is a lot of competition by the actors in this sector in order to accumulate enough load of waste since the heavier the load the bigger the income and therefore their health becomes secondary to the income.

Fire is a constant hazard at the dumpsites with numerous spots that experience spontaneous combustion. While the respondents are conscious of the risks presented by these 'boilers', they can only try to avoid them (Zamberia, 2006). Often, however, the waste collectors light fires to cook, warm up or burn old garbage to recover metals, further contributing to the risk and the smog that constantly overhangs the area which exposes them more, to higher risks. This result concurs with Baud and Post (2003) who in their research between Nairobi and Hyderabad concluded that the working conditions of solid waste collectors are unsafe and unhealthy, as they do not take any protective measure. This results replicate the study conducted by the Japan International Cooperation Agency (JICA) in a dumping site in Dandora (JICA, 1998) where by there were complains about, smoke, smell and broken glasses.

Most of the respondents in this study confirmed that they suffer from serious headaches and backaches. The headaches can be attributed to the fact that most of them work under direct sunlight as they scavenge for items to sell, their working conditions in the dumpsite also

exposes them to smoke fumes which not only results to headaches but also to respiratory truck diseases. In such for saleable items the waste pickers walk for long distance with loads in their backs and a few carry them using hand carts. Because of the distance between points of collection and the points of selling most of them complain of serious backache problems. The waste picker's health in this study is conceptualized as a very important asset that will enable them to earn a sustainable livelihood. Their income generation is largely dependent on their health unfortunately only an insignificant effort is being made by the waste pickers as a safety precaution towards their very important asset, but rules should be enforced to ensure that health facilities within the municipality should ensure that their wastes are treated and incinerated before final disposal.

Stick injuries are the hazards most likely to endanger health, in relation to waste management. Such injuries may be avoided by taking the following precautions.

1. Wearing heavy duty gloves to protect hands when handling sharp containers.
2. Sharp containers should be picked only by the handle.
3. Wearing heavy duty gloves when moving waste sacks/bags.
4. Holding waste sacks by the closure end only.
5. Wearing sturdy shoes or industrial welling boots (safety boots) to protect the feet if waste sacks or containers are accidentally dropped; these will also help to prevent falls in storage areas where the floor might be slippery.
6. Wearing leg protectors or industrial aprons (overalls) if there is a possibility of clinical waste sack bags brushing against the body and or clothing during transfer.

It is therefore evident from the findings of this study that most of the individual waste workers are prone to suffer from 'stick injuries' since most of them do not wear the Personal Protective Equipments (PPE). Though the study did not delve into the real ailments suffered by the waste collectors in solid waste management, literature review reveals that dust and foul smell from waste may contain miniscule particles that are lethal to human beings, for instance smell from dead animal's releases methane into the air and has been proved to cause cancer

4.2.3 Strategies for SWM

With the increasing cost of raw materials, recycling provides a cheaper source of raw materials for manufacturing industries. Sorting and separation of municipal solid waste is gaining importance in various sectors. This study found out that at the dumpsite there is

intense scavenging for recyclables in the disposed waste. According to Rotich *et al* (2005) Scavenging was initially driven by poverty and a desire to earn a living, but the emergence of recycling industries has given a boost to search for recyclable materials in the dumpsites as a ready market for the materials exists making it a popular solid waste Management strategy for the waste collectors.

This study has established that Recycling and Reuse remains the most commonly used strategies for Solid Waste Management in Nakuru municipality. Incineration as a strategy of solid waste management is not utilized in the municipal area apart from the municipal dumping site and in which case not actual incineration is done but burning of waste and therefore this study concurs with UNEP-IETC (1996) that the strategy remains a low option for Africa.

The low educational levels, lack of basic technical skills and limited ability to learn new composting techniques among the actors in solid waste management impact negatively on their ability to produce for economic gains and hence the reluctance to venture into the field. The sale of compost does not have a sufficient income and the process of composting is labour intensive, cumbersome and emits a lot of foul smell which in turn discourages the actors from pursuing it. Further more because of lack of separation from the source compost products made from wastes have been of poor quality because they are contaminated with glass pieces, sharp objects, plastics and industrial and medical contaminants making them not easy to sell and hence un attractive to actors in Solid Waste Management (Furedy, 2004) this fact has greatly been disputed by the MEWAREMA who assert that separation and sieving of waste is done before composting and all the impurities like glasses are removed and therefore the final product is of high quality..

4.2.4 Stocks of Asset and SWM

The conceptual framework in this study identified five stocks of assets namely the Human, Social, Physical, Natural and Financial capitals which combine to enhance sustainability. This study established that there are class and educational differences in the measure of social resources on which people can draw and use them to earn a living. This is evident in that the majority of the actors earn less than 5000 shillings but cannot be able to control the prices of saleable commodities even though their numbers far exceed the numbers of those earning over 10000 shillings, this can further be explained by the fact that the waste collectors have

weak bonds and while providing some impression of security in times of need, they also serve to exclude them from the broader social process this concurs with Julius (1996), Beall (2000). The MEWAREMA case also serves to confirm that social capital can indeed foster group unity and provide a common ground for articulating their issues like the environmental concern in planting trees to avert pollution in the dumpsite.

This study found that the physical capital (Infrastructure) is lacking in Nakuru municipality to aid in Solid Waste Management as is evidenced by the spilling waste into the various waste collection centre's and waste scattered in the roadsides of our streets. The Municipal dumpsite is located in the western side of the town and waste collectors walk long distances in search of materials to Salvage. The health facilities are failing in safe waste disposal as they lack the capacities to treat and incinerate their waste before disposal which pose greater heath risks to the actors and thus affecting their health which is one of their most important Human capitals. According to Rotich *et al* (2005) the MCN does not have enough trucks to carry waste and the few that are available are very old which explains why waste is scattered in open dumpsites. It is however important to note that the town is endowed with a number of health facilities both private and public and also a number of schools and thereby it can be argued that though poverty hinders the development of the individual to fully develop their stocks of asset the information is available and needs to be utilized.

Political capital is an important asset in the success of solid waste management. Political goodwill must exist for the waste collectors to attain their livelihoods. Environmental organizations like NEMA have developed policies that should guide in waste management. The public private sector inter phase should receive political backing to effectively and efficiently provide solutions to problems afflicting the municipality. This study observed that with three trucks that are constantly breaking down the municipality does not have the capacity to collect all the waste, but also the local authority has not recognized the efforts undertaken by the informal sector who though are collecting waste for economic gains do reduce the waste in the municipality substantially. Natural capitals have been used by the actor in Solid waste Management as can be exemplified by one group that was composting and selling manure. The MEWAREMA group has used natural resources in composting of wastes like Effective Microorganism (EM) which is developed from bacteria, due to the cost implications of the EM the group has resulted to use the leaves of Tigoni tree which has yielded them the desired results. It is important to note that the group has also recognized that

air pollution can be averted by planting trees which the group has embarked on in the dumpsite.

4.2.5 Vulnerability Context

The section is closely associated to the capitals of the waste collectors and concentrates on the vulnerability context which encompasses shocks such as illness, stresses such as population growth and seasonality such as fluctuating prices. Health is an important asset for the solid waste actors but the shocks they experience damage the portfolio which forms the basis of their livelihoods. Pollution, unemployment and education are also other shocks that inhibit the maximum utilization of the asset portfolios by the waste collectors. Political capital and environmental policies are gradual trends that have effects on the various actor and institutions

a) Health

Poor health in this study was envisaged as a culmination due to lack of safety precautions thus the individual is exposed to situations that might be detrimental to his wellbeing. Poor health is a common occurrence among the solid waste workers which is compounded by their working environment. Collecting garbage and working without undertaking any health precaution exposes the solid waste workers in a vulnerable position which in turn my inhibit their productivity levels. In Nakuru municipality over 91% of the respondents were found to be exposed to dusty environments which jeopardizes their health and leads to a number of respiratory tracts infection diseases. Seventy seven percent of the respondents suffered from severe headaches and backaches because of working directing under the sunlight and walking long distances. Frequent ailments further more deprives off the solid waste workers the much needed time to work and further exposes them to more vulnerability and entangles them in the vicious cycle of poverty

Accumulation of decaying waste provide the propagation ground for insects which are agents for the spread of diseases as seen in Plate 4.1, 4.2 and 4.3. This provides grounds for the storage of rain waster or blocked drainage water which in turn breed insects like mosquitoes which are vector for the transmission of Malaria to waste workers and the general population. Decaying waste due to decomposition resulting from biological microorganism also emits foul smell which makes it difficult to work in this sector.

b) Unemployment

Most of the solid waste workers are in the sector as a survival strategy and secondly due to the lack of any other form of employment. This is explained by their academic deficiencies as observed from this study only a partly 33.3% of the respondents had gone beyond primary school. This can also be explained by the fact that the town population has increased significantly over the years. Solid waste workers do not have a steady income or job security which makes them vulnerable as a result of the uncertainties they encounter for instance fluctuating market prices for their products and harassment by residents who only see them as thieves bent on stealing from them as shown in Figure 4.5, over forty three percent of the respondents were actually harassed by the residents within the municipality.

c) Institutional trends

The government has set up various institutions like NEMA tasked to oversea the protection of the environment basically the brown agenda which deals with local scale environmental pollution. The institution has developed rules that require industries and related institutions undertake environmental auditing and environmental impact assessment studies to counter the effects of pollution. The Nakuru Municipal Council has developed By-Laws to guide on environmental issues and one such law requires that any person who uses polythene bags for whatever purpose should bear the cost of treating and disposal, the law also demands that any one within the jurisdiction of the council be entitled to a clean and healthy environment and has a duty to safeguard and enhance environmental issues.

Though the rules and laws exist to provide simple solutions for the brown agenda within the municipality, little has been done to enforce them which explain why even the plastic paper bags have continued to chock the environment without the users meeting the cost of treating and disposal. It is also notable that the Nakuru municipality bars private firms from dealing in garbage collection and transportation or disposal of any waste without the authority of the director of the environment. The bureaucracies involved in getting the authority scare some private investors and since the waste generated overwhelms the Municipal Council the participation of private sector is needed which leads to the infiltration by the informal sector. Most of the waste generated is dumped in illegal dumpsites or even in open plots (Plate 4.3) because the municipal authority lacks monitoring and evaluation strategies to mitigate the problem.

Waste disposal in the municipality is also hampered by inadequate infrastructure since there is only one designated dumpsite that serves the whole municipal jurisdiction, located in the western side of the town the dumpsite is an old abandoned quarry where open dumping is practiced. Some people have encroached the dumpsite for settlement and when wind blows most of the plastic bags are blown to nearby neighbourhoods causing an environmental threat and a public nuisance and also acting as the media for transmitting airborne diseases. When it rains water is trapped within the dumpsite acting as the breeding ground for mosquitoes and in the same line transmitting reactive chemicals to the water table beneath causing a life threatening scenario.

The major challenge facing individual solid actors in Nakuru municipality is how to earn their livelihoods sustainably, unfortunately people are aware of the effects of poor waste handling and the associated dangers but they seem not to be bothered and therefore increasing their vulnerability. Though income has been earned by waste collectors majority of them have earned so little to enable them earn a decent livelihood. The study has also outlined the capitals inherent in waste collectors that have helped them to attain or hindered them from attain their livelihoods sustainably.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the major research findings, conclusions from the findings and recommendations drawn for the conclusions. The study sought to examine the extent into which solid waste management contributes to the livelihood of the vulnerable waste collectors. This study set out to achieve the following specific objectives: to ascertain the possible income generated from waste by the waste collectors and how it has been used to improve on their livelihoods as waste collectors; assessing the occupational health hazards and risks associated with solid waste management and lastly to highlight the strategies used and how they have improved on urban livelihoods. The study adopted a sustainable livelihoods approach through an adopted UNDP framework where the assets utilized by the actors were examined.

Based on the above objectives, the study raised the following pertinent questions: Which economic and social benefits have the waste collectors derived from solid waste management and has it had any effect on their livelihoods?; What are the occupational health hazards and risks associated with solid waste management?; and lastly which strategies do the waste collectors use in solid waste management and have they improved on their livelihoods?

The research employed a case study design and the research area was Nakuru municipality. Observations and interview schedules were used as the data collection instruments where 192 respondents informed the study. Secondary data were collected from documented information about Solid Waste Management in the municipality. Data was analyzed using the statistical package for social sciences.

5.2 Summary of the Results

The influx of people into the Nakuru municipality has led to competition for the few available employment opportunities which has resulted to the remaining unemployed population looking for alternative sources of employment. This has led to a vibrant informal sector where the residents have resulted to scavenging for saleable items in order to earn a

livelihood. Solid waste management has been adopted as a survival strategy by the unemployed people in the municipality and has provided for their daily needs.

5.2.1 Income Generation

Based on the objective and the research questions, the following findings are presented. The study revealed that the waste collectors earn their livelihoods from solid waste management though the income varies depending on age, education and the type of waste collected. Majority of Those who had gone up the primary school level of education were collecting plastics while majority of those in secondary and tertiary institutions collected scrap metals. The study also established that the scrap metal waste fetched more income than the rest with garbage collection being the least income earner. Majority of the waste collectors were in the 25-36 years age bracket.

Based on the income variations the study established that there is a lot of exploitation in the sector since majority of the waste collectors have not developed reciprocal networks. The "haves" have continued to exploit and manipulate the "have not's" and this explains why the majority are earning so little while the minority are earning so much. The study ascertained through the NAWCOM and MEWAREMA experience, social capital can be used as a bargaining tool to earn more income when a group of people with a common purpose and aim come together.

The study also revealed that most of the waste collectors have also been able to earn some subsistence and educate their children from their income while a few have been able to build their own residential houses. Though the waste collectors end up in solid waste management due to lack of alternative employment most of them have been able to earn their livelihoods in the sector, they have supported their families, educated their school going children and some have acquired some properties like land and houses which they can use as collateral in financial institutions to get more money for development.

5.2.2 Occupational Health hazards and Associated Risks

The study also found out that the waste collectors have been working in conditions that put their health, which is an important asset for them at risk for not undertaking any precaution. The waste collectors get cuts from broken glasses and metals in the dumpsites. They are also subjected to dusty environments which may lead to some respiratory track infection and

eventually lower down their working morale. Foul smell is emitted from the decaying matter in the dumpsites foul smell though may not cause any direct injury is known to lead to stress however some poisonous gases like methane and carbon monoxide are known to be emitted from decaying and burning matter and they may be injurious to the waste collectors. Due to carrying heavy luggages for long distance the waste collectors also suffer from backaches while headaches are caused by working directly under the sun.

The research has established that poverty constrains the poor to work in such inhumane conditions. Majority of the waste collectors do not use any protective garment like gloves, safety boots, overalls or inhaler masks in their working environment which exposes them more to the occupational hazards. Even if the daily income of the waste collectors is around minimum wage, the waste collectors are poor because they lack safety nets, have hazardous working conditions and are exposed to income irregularities and stigmatization and cannot therefore afford to buy the above listed items.

5.2.3 Solid Waste Strategies

This research has also established that the popular strategy for solid waste management in Nakuru municipality is recycling where the waste collectors scavenge for saleable items and sell them to recyclers. Though composting might have some environmental gains not many actors wanted to practice it since the compost manure from solid waste does not fetch good market prices and the process itself is laborious.

The type of strategy adopted by the waste collectors is also dependent on the type of waste to be disposed. The scrap metals, plastics and papers adopt the recycling strategy, a few of the plastics collectors use the reuse strategy while a few of the garbage collectors compost their waste. A few individuals also earn income by collecting waste from households and dispose them to designated dumpsites.

5.2.4 Vulnerability and Stocks of Assets

The study has established that some livelihoods assets namely: social capital; human capital; financial capital are more used by the waste collectors compared to physical capital and natural capital. When these assets are well utilized the actors can attain a sustainable livelihood which propels them to achieving more favourable outcomes.

The study has also enumerated a number of vulnerability contexts which inhibit their production ability which include "academic dwarfism", influx of people in the sector due to lack of alternative employment, predisposition to inhumane conditions, exploitation and lack of job security. The study also noted that most of the institutions are "silent" and do not come into play in the case of waste collectors and the laws cannot be used against them neither do most of them know the existence of such laws.

5.3 Conclusions

The study concludes that the waste collectors have a certain unfortunate-dependency relation with waste. Failures of proper waste management in waste collector's areas cannot be solved from resource stricken administrations and poor infrastructure. Despite this, much can be achieved through the use of a participatory approach and in the context of the livelihoods framework

5.3.1 Theoretical Conclusions

This study used the modified DFID livelihoods frame work to understand the influence of solid waste on the livelihoods of the waste collector. The livelihoods approach is based on the evolving thinking about poverty reduction, their vulnerability and how they can utilize their capitals to improve on their livelihoods outcome,

From the study social capital is developing though the waste collectors tend to be individualistic and therefore end up exploiting one another. Social capital can give socioeconomic benefits in solid waste management through enabling information sharing, collective action and decision-making especially in pricing of saleable items. In practice social capital influence society's capacities to build networks and decrease non-trusting behaviour. Social capital can have significant effects on economic growth and development through enhanced production output and more efficient use of human and physical capital.

It is important to recognize that vulnerability or livelihood insecurity is a constant reality for many poor people, and that insecurity is a core dimension of most poverty. Among the vulnerabilities identified in this study were the low income levels, low educational levels by the individual waste collectors, job insecurity and unhealthy working environments

From the experiences of the two case studies of MEWAREMA and NAWACOM it is important to note how social capital can be developed among the waste collectors and form networks and institutional trends that can enhance the other capitals in the livelihood frameworks. The two institutions can be seen as examples of how trust can be build amongst individuals and enhance the collective bargaining for better livelihoods approach.

5.3.2 Empirical Conclusions

The problems facing developing countries in handling of municipal solid are not impossible to solve but they need concerted effort from all sectors of society. MSW management is the responsibility of every resident. An all inclusive approach should be adopted in order to achieve any meaningful and lasting solution. It is evident from this study that the solid waste workers in the Nakuru municipality earn an income from their management practices. This income has been used for supporting their livelihoods through subsistence, School fees, paying rent and even to some constructing their residential houses. However this study concurs with Furedy (1992) who asserts that there is an element of exploitation in solid waste management. It is evident from the differences in income between the actors as one group of the collectors who collect daily are exploited by the affluent who are able to sell them in bulk after accumulating them.

The marketing of compost products within the urban and peri-urban areas is not developed and the farmers are not well enlightened on the importance of compost manure compared to the organic fertilizers which are expensive both in cash and kind to the farmers in the way that they wear out the soils after continuously using them

Majority of the respondents in this study were undertaking solid waste management as a result of lacking any other alternative job this concurs with Cointreau and de Kadt (1991) who assert that solid waste management is often undertaken as a survival strategy when the waste collectors are unable to join formal employment. This is as a result of the high rates of unemployment in the municipality which stands at 35% according to Rotich *et al,* (2005).

This study was also able to establish that a few of the actors in this sector were capable of earning over Kenya Shillings 90,000 which makes them among the top earners in the country bearing in mind the minimum wage in the country is less than Kenya Shillings 5,000.

However it is important to note that the majority of the actors in this sector can still be considered to be among the lowest income earners in the country.

This study also concludes that in spite of scavenging providing a means of livelihoods to the waste collectors it also substantially reduces the final waste that needs disposal in the municipal dumping site which according to Ouano (1991) has both financial and environmental benefits. The study shows that through solid waste management the waste collectors are able to benefit economically as well as improve the environment through waste minimisation.

It is evident from the study that the actors in solid waste management oblivious of their working conditions and in search of livelihood end up working in deleterious conditions which are characterized by cuts, smoke fumes, bad odour, backaches and headaches and because of poverty and the desire to accumulate enough load for economic viability they do not take any safety precaution and end up working without undertaking any protective measures like gloves, safety boots, overalls or even inhaler masks. Therefore the sector needs to be regulated by the municipal authorities to ensure a conducive working environment.

The strategies employed by the solid waste actors in Nakuru municipality to earn a living which include recycling, reuse and composting contributes significantly to reducing the waste that is scattered all over the suburbs. Solid waste management poses big problems to municipal authorities due to the fact that they lack space for disposal, in fact as Baud and Post (2003) asserts effective collection only exacerbates disposal problem. This study established that even where the disposal facilities are strategically placed waste is scattered allover the place therefore posing a greater disposal problem.

The study also concludes that the municipality and the health facilities do not meet environmentally safe MSW disposal levels because of a lack of sanitary landfills and incinerators therefore posing great health risks to the waste collectors as they scavenge for some saleable items.

5.4 Recommendations for Policy and Further Research

This makes the following recommendations:-

5.4.1 Policy Recommendations

1. The study found out that the poor are not too poor to manage solid waste within the municipality. With a pro-poor solid waste management approach in policy-making, including structural subsidies to informal initiatives, recognition of the individual waste workers and life among the waste collectors need not be a life of deprivation. The waste collectors should be empowered through the public private partnership to ensure livelihood sustainability.

2. There should be a participatory approach in the management of municipal solid waste by involving all stakeholders who include the civil society, NGOS, CBOs and the informal sector so as to facilitate the planning process, mobilization of resources and the maintenance of economic, social and environmental infrastructure.

3. The study found out that a lot of waste is left lying in undesignated dumpsites and therefore the local authorities should undertake management reforms to bring an end to unsightly areas of uncollected or illegally dumped solid wastes by adopting the 3Rs approach of Reducing, Reusing and Recycling waste which will result in the minimization of waste reaching the drop off points.

4. The study established that solid waste management poses health risks and efforts should be made to minimize the occupational health hazards for the waste collectors in solid waste management by advocating for the use and application of safety precautionary measures since solid waste management forms part of the brown agenda. That the brown agenda focuses more on the immediate localized and health related effects while the green agenda deals on the delayed, dispersed and ecological effects of the environment.

5. The study found out that some solid waste strategies are not suitable to the waste collectors due to their unpredictable income and therefore suitable technologies as dictated by the composition of the waste generated needs to be explored and encouraged with emphasis on the fact that the solid waste workforce needs to be

assured of employment which will provide a living wage and a certain level of job security.

6. The study established that there is a ready market for reusable and recyclable solid waste materials in the "Jua Kali" sector. Therefore there is need for the Ministry of Local Government to consider offering a tax concession to industries involved in developing reusable products that will reduce solid wastes intended for disposal. The local artisan groups (Jua Kali) should be trained on marketing their products as they ultimately provide a ready market and an avenue for reuse of old and disposable waste.

5.4.2 Areas for Further Research and Action

1 The study found out that open dumping is practised in the municipal dumpsite and therefore an investigation into the extent of pollution of groundwater urgently needs to be carried out within the vicinities of the MSW dumpsites to safe guard the lives of the residents of the municipality and especially those who live within the vicinities of the dumpsites. The extent of groundwater pollution in and around the dumpsites still is unknown because adequate pollution assessment studies have not been conducted on the groundwater.

2 The study established that composting is not a popular strategy in the municipality because of the difficulty in selling the end product. A study should therefore be conducted on composting as a SWM strategy that can be economically viable to the waste collector, the farmer and the environment in general. Marketing of the end product as an alternative to the organic fertilizers should be encouraged by learning the usefulness of the composted products

3 Further research on the impact of SWM on the health of urban workers should be conducted as a case study to establish its effect on the healthy life of an individual worker. The study concentrated on the occupational hazards encountered by the waste collectors in SWM and therefore an in-depth study should be conducted to establish the major ailments encountered by the waste collectors as a result of solid waste management.

REFERENCES

Allison, M., Harris, P. J. C., Hofny-collins, A. H. and Stevens, W. (1998). *A Review of the Use of Urban Waste in Peri-Urban Interface Production Systems*. Coventry, Henry Doubleday research association.

Bartone, C., (2000). *Sustainable Cities in Developing Countries. Theory and Practice at the Millennium*. London: Earth Scan Publication Limited

Baud, I. S. A. (2000). '*Collective Action, Enablement and Partnership, Issues in Urban Development'*. Inaugural address, Free University 27th October2000.

Baud, I.S.A. 2004. 'Re-use Recovery and Recycling of Urban Inorganic Solid Waste: Modalities, Commodity Chains and Sustainable Development' in: Baud, I.S.A., Post, J., Furedy, C. (2004). *Solid Waste Management and Recycling; Actors, Partnerships and Policies in Hyderabad, India and Nairobi, Kenya*, Kluwer Academic, Dordrecht, London, NY

Baud, I. S. A. Grafakos, S., Hordijk, K. M., and Post, J. (2001). 'Quality of Life and Alliances in Solid Waste Management. Contribution to Urban Sustainable Development' *Cities*. Vol. 18 No. 1 (3-12)

Baud, I.S.A. and Post, J. (2003). 'Between Markets and Partnerships: Urban Solid Waste Management and Contributions to Sustainable Development?' *Global Built Environment Review*, Volume 3, Issue 1, pp. 46-55

Beall, J. (1997). 'Thoughts on Poverty from a South Asian Rubbish Dump: Gender Inequality and Household Waste'. *Institute of Development Studies. Bulletin,* Vol.28 No.3 pp73-90.

Beall, J. (2000). *Valuing Social Resources or Capitalising on them? Limits to Pro-poor Urban Governance in Nine Cities of the South.* London, London School of Economics

Berkes, F. (Ed) (1989*) Common Property Resources: Ecology and Community –based Sustainable Development.* London, Belhaven Press

Carney, D. (Ed) (1998). *Sustainable Rural Livelihoods. What contribution can we make?* London: Department for International Development.

Carney, D., Drinkwater, M., Rusinow, T., Neefjes, K., Wanmal, S., and Singh, N. (1999). *Livelihood Approaches Compared. A Brief Comparison of the Livelihoods Approaches of the UK Department for International Development (DFID), CARE, Oxfam and the United Nations Development Programme (UNDP).* London: Department of International Development.

Chambers, R. (1989). 'Vulnerability, Coping and Policy'. *Institute of Development Studies Bulletin* Vol.20 No.2 pp 1-7

Cochran, W. G. (1977). *Sampling Techniques*, 3rd Ed., New York: John Wiley and Sons.

Cointreau, S. (1982). *Environmental Management of Solid Wastes in Developing Countries.* Washington DC: The World Bank.

Cointreau, S. J. and M. de. Kadt (1991). *Living with Garbage: Cities Learn to Recycle.* Development Forum. January-February

Cointreau-Levine, S. (1994). *Private Sector Participation in Municipal Waste Services in Developing Countries.* Vol. 1 *The Formal Sector Urban Management Programme.* Discussion paper 13. UNDP/UNCHS/World Bank Urban Management Programme. Urban Management and Environment.

Devas, N., (1999). *Who Runs Cities? The Relationship between Urban Governance, Service Delivery and Poverty. Urban Governance, Partnership and Poverty Theme.* Paper No. 4 International Development Department School of Public Policy, University of Birmingham,

Dijk, M P van, (2001) 'Challenges for Urban Managers in Emerging Economies, Particularly in India', in: Baud, I., J. Post, L. de Haan & T. Dietz. (Editors), *Re-aligning Government, Civil Society and the Market*, , Amsterdam: AGID

Doan, D. L. (1998). *Institutionalising House Hold Waste Collection: The Urban Environmental Management Project in Cote D' Ivore.* Habitat International.

Furedy, C. (1992). Garbage: Exploring the Options in Asian Cities. *Environment and Urbanisation.* Vol. 4 No.2 pp42-61

Furedy, C. (2004). *Urban Organic Solid Waste: Re-Use Practices and Issues for Solid Waste Management in Developing Countries.* In Isa Baud, Johan Post and Christine Furedy (Editors), *Solid Waste Management and Recycling; Actors, Partnerships and Policies*

in Hyderabad, India And Nairobi, Kenya. GeoLibraries Series, No 76, Kluwer Academic Publishers, Dordrecht, pp. 197-211

Gilbert, R., Stevenson. D., Giraldet, H., Tren, R. (1996). *Making Cities Work. The Role of Local Authorities in the Urban Environment.* London, Earthscan Publication Limited.

Henderson, J. V., (2002), 'Urbanization in Developing Countries'. *The World Bank Observer* 17(1) 89-112

Hoornweg, D., and Thomas, L., (1999). *What a Waste: Solid Waste Management in Asia. Urban and Local Government* Working Paper Series No.1, The World Bank, Washington, D.C.

Hunt, C. (2002). *Poor pickings. The Dangers of Waste Collection in Developing Countries.* ID21 urban poverty. www.id21.org/health/h/ochlgl.html

Huysman, M. (1994). 'Waste-Picking as a Survival Strategy for Women in Indian Cities'. *Environment and Urbanization*, Vol. 6 No. 2: 155 -174.

Jerie, S. (2006). 'Analysis of Institutional Solid Waste Management in Gweru'. *Journal of Eastern Africa Social Science Review. Vol. XXII No. 1 pp103 – 125*

JICA, (1998). *The Study of Solid Waste Management in Nairobi City in the Republic of Kenya.* Japan International Co-operation Agency.

Julius, W. (1996). *When Work Disappears, the World of the New Urban Poor.* New York, Alfred A. Knopf.

Karanja N. (2009). 'Cleanest Town' now laden with Waste Burden. The Standard Newspaper, (15th April 2009) *p. 20*

Kundu, N., (2002). *Traditional Waste Recycling Under Threat.* Insight May 2002.

MacGranahan, G. and Sattrthwaite, D. (2000). 'Envoronmental Health or Ecological Sustainability? Reconciling the Brown and Green Agendas' Urban Development in C. Pugh, (Editor), *Sustainable Cities in Developing Countries.* London, Earthscan pp. 73-90.

Medina, M. (1997). *Scavenging on the Border: A study of the Informal Recycling Sector in Laredo, Texas, and Nuevo Laredo, Mexico.* Ph. D. Dissertation, Yale University.

Mwangi, S. W. (2000). 'Partnership in Urban Environmental Management: An Approach to Solving Environmental Problems in Nakuru, Kenya' *Environment and Urbanisation* Vol. 12 No.2pp 77-92.

Mwangi, S. W. (2001). *Urban Environment Action Plan and Local Agenda 21 Series. Working Paper No. 10. Local Agenda 21 Experience in Nakuru, Kenya: Processes Issues and Lessons.* International Institute for Environment and Development. Human Settlement Programme.

Mwangi, S. W. (2002). *Challenges of Urban Environmental Governance: Participation and Partnership in Nakuru Municipality, Kenya.* Universitert Van Amsterdam, AGIDS

Mwangi, S. W., (2008). *Examining the Effectiveness of Local Authority Transfer Fund (LATF) and Constituency Development Funds (CDF) in Attacking Urban Poverty and Human Rights in Kenya.* UNESCO. UNESCO Small Grants Programme on Poverty Eradication Building National Capacities for Research and Policy Analysis Summary of the Findings and Recommendations of the Selected Research Projects February 2008

Municipal Council of Nakuru (1999). *Nakuru District Development Plan (2002 – 2008). Effective Management for Sustainable Economic Growth and Poverty Reduction.* Ministry of Planning and National Development. Nairobi. Government Printer.

Obirih-Opareh, N. (2002). *Solid Waste Management in Accra: The Impact of Decentralisation and Privatisation on the Practise and Performance of Service Delivery.* Universitert Van Amsterdam. AGIDS.

Ouano, E. (1991). *Developing Appropriate Technology for Solid Waste Management in Developing Countries. Metro Manila Pilot as a Case Study.* International Expert Group Seminar on *Policy Responses towards Improving Solid Waste Management in Asia Metropolises*. Bandung, Indonesia, February 4-8.

Post, J. and Mwangi, W. (2006). *Community Action and Partnering In Nakuru. A Critical Appraisal of the Process of Service Upgrading In Low-Income Neighbourhoods.* Amsterdam Institute for Metropolitan and International Development Studies (AMIDST) Universiteit Van Amsterdam. Amsterdam. The Netherlands

Raini, J. (2009 April 30th) Solid Waste Management. http://flamingonet.org accessed on 30th April 2009

Rakodi. C. 2002. *A Livelihoods Approach – Conceptual Issues and Definitions* in Rakodi, C. with Lloyd-Jones, T. (Editors) *Urban Livelihoods: A People-Centred Approach to Reducing Poverty*, London: Earthscan, p. 3-22

Rakodi, C. and Lloyd-Jones (Editors) (2002). *Urban Livelihoods: A People Centred Approach to Reducing Poverty.* London Earth Scan Publication Limited.

Republic of Kenya. (2000*). Poverty Reduction Strategy Paper 2000-2003.* Nairobi, Government Press.

Republic of Kenya. (2001). *The 1999 Census Results.* Ministry of Planning and National Development. Nairobi, Government Press.

Rotich, H. K., Zhao, Y. S. and Dong, J. (2005). *Municipal Waste Management Challenges in Developing Countries – Kenyan Case Study.* www.sciencedirect.com accessed 5th April 2008

Sarkar, P. (2003) "*Solid Waste Management in Delhi – A Social Vulnerability Study*" in Martin J. Bunch, V. Madha Suresh and T. Vasantha Kumaran, (editors.), Proceedings of the Third International Conference on Environment and Health, Chennai, India, 15-17 December, 2003. York University. Pages 451 – 464.).

Skinner, J. H., (1995). *Preface in International Directory of Solid Waste Management. 1995.* The ISWA yearbook.

Slater, R., Chasca, T., (2003). *Hidden Livelihoods? Natural Resource Depedent Livelihoods and Urban Development Policy. Working paper 225.* Overseas Development Institute. London.

Solesbury, W. (2003). *Sustainable Livelihoods. A Case Study of the Evolution of the DFID Policy.* Working paper 217. London, Overseas Development Institute

Solid Waste Management Manual (2000): *Central Public Health and Environmental Engineering Organisation (CPHEEO), Government of India.* South Africa United Nations Economic Commission for Africa.

UNCHR (2002). *Draft Guidelines: A Human Rights Approach to Poverty Reduction Strategies.* Office of the High Commissioner for Human Rights. United Nations.

UNCHS (1996). *An Urbanising World: Global Report on Human Settlements.* United Nation Centre for Human Settlement.

UNEP (2005). *Selection, Design and Implementation of Economic Instruments. in the Solid Waste Management Sector in Kenya. The Case of Plastic Bags.* Geneva. UNEP.

UNEP-IETC (1996). *International Source Book on Environmentally Sound Technologies for Municipal Solid Management.* Osaka/Shiga, UNEP International Environmental Technology Centre.

United Nations Development Programme (2000). *Human Development Report 2000.* Oxford University Press. New York.

World Bank (2001), *Urban Environmental Priorities.* Draft for Discussion, C. R. Bartone, Urban Development Division, Infrastructure group, Washington D. C.

Xerox Corporation (1998). *Business Guide to Waste Reduction and Recycling.* New York Webster,

Zamberia, C. I. (2006). *Opportunities and Challenges in Privatising Urban Environmental Infrastructure: Lessons from the Dandora Dumpsite Nairobi.* University of Johannesburg

APPENDICES

APPENDIX 1: INTERVIEW SCHEDULE

Interview schedule on the study of influence of informal solid waste management on livelihoods of urban solid waste collectors: a case study of Nakuru Municipality, Kenya

Dear Respondent,

You are kindly requested to provide the information asked below. Your co-operation is highly appreciated and you are assured that all the responses will be treated with high confidentiality and will only be used for research purposes.

Stephen Karanja (Researcher)

Deparment of Sociology and Anthropology

Egerton University

Njoro

Personal information

1. Name (Optional).....
2. Age .....
3. Gender(a) Male ( )
   (b) Female ( )
4. What is your educational level (please indicate the highest)
   (a) Primary School ( )
   (b) Secondary School ( )
   (c) Colleges ( )
   (d) University ( )
   (e) Others (Please specify) .....
5. What is your marital Status?
   (a) Single ( )
   (b) Married ( )
   (c) Divorced ( )
   (d) Seperated ( )
   (e) Others (please Specify).....
6. Please state the number of dependant's children in your home. .....

Social Economic status

7. In which location is your working place located in the Municipality.....
8. Where do you live within the Municipality? .....
9. For how long have you lived in your current residential area? .....
10. Is the house owner occupied or rented?
    (a) Owner Occupied ( )
    (b) Rented ( )
11. If the house is rented, how much do you pay per month? .....
12. How many children are you educating in the following institutions?
    (a) Nursery School. .....
    (b) Primary School. .....
    (c) Secondary School .....
    (d) Colleges. .....
    (e) University. .....
    (f) Others. .....
13. Were you employed before joining the solid waste management sector?
    (a) Yes ( )
    (b) No ( )
14. If yes what made you to leave your job and venture into solid waste management?
    (a) Retrenchment ( )
    (b) Low income ( )
    (c) Others (Specify) .....
15. For how long have you been working in the solid waste management sector? Please indicate in years. .....
16. What is your monthly income derived from solid waste management?.....
17. Are you satisfied with the money or income that you generate from waste management? .....
18. What have you achieved with the money that you have generated from solid waste management?

    .....

.....

19. What kind of solid waste material do you collect, transport or dispose?

.....

.....

.....

.....

20. Which solid waste management strategy do you employ?.....

.....

.....

21. How frequent do you collect, transport or dispose solid waste?

(a) Everyday ( )

(b) Weekly ( )

(c) Monthly ( )

(d) Others (specify) .....

22. How would you rate your working environmental condition?

(a) Very Good ( )

(b) Good ( )

(c) Moderate ( )

(d) Poor ( )

(e) Very Poor ( )

23. In which area of the municipality do you operate? .....

24. In the last one-year how many times did you visit a heath facility?

(a) 0

(b) 1-3

(c) 4-5

(d) Over 6

25. Can you please state the most frequent ailment experienced?

.....

26. In your work place do you encounter any clinical waste material?

(a) Yes ( )

(b) No ( )

27. Which safety precautions do you take when working with solid waste management?

a. .....

b. .....

c. .....

d. .....

e. .....

28. In your opinion what are the problems associated with Solid waste management?

.....

.....

29. What links do you have with other individuals in this sector?

.....

.....

30. How important are these links in your attaining a livelihood through solid waste management?

.....

.....

31. What organisations, institutions and associations are you involved with and what role do you play in them?

.....

.....

32. What do you consider your greatest ASSET in attaining your livelihoods through involvement in solid waste management?

a. .....

.....

.....

b. .....

.....

.....

.....

c. .....

.....

.....

d. .....

.....

33. What do you consider your greatest WEAKNESS in attaining your livelihoods through involvement in solid waste management?

.....

.....What do you consider your greatest challenge or problem in attaining your livelihoods through involvement in solid waste management?

.....

.....

34. How would you address this challenge?

.....

.....

----------**Thank you**----------

APPENDIX 2: RESEARCH PERMIT

CONDITIONS

1. You must report to the District Commissioner and the District Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2)/four(4) bound copies of your final report for Kenyans and non-Kenyans respectively.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

GPK 6055—3m—10/2003

REPUBLIC OF KENYA

RESEARCH CLEARANCE PERMIT

(CONDITIONS—*see* back page)

PAGE

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss STEPHEN NJOROGE KARANJA

of (Address) EGERTON UNIVERSITY P.O.BOX 536-20115, NJORO

has been permitted to conduct research in NAKURU MUNICIPALITY Location, NAKURU District, RIFT VALLEY Province,

on the topic THE INFLUENCE OF SOLID WASTE MANAGEMENT ON THE LIVELIHOODS OF THE URBAN INDIVDUAL ACTORS: A CASE STUDY OF NAKURU MUNICIPALITY

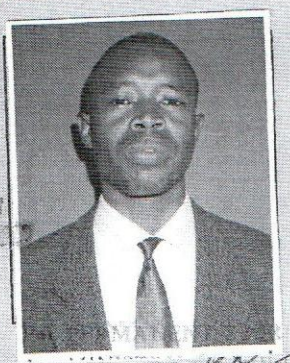
for a period ending 30TH NOVEMBER, 20 07

PAGE 3

Research Permit No. MOST 13/001/37C 379

Date of issue 29.6.2007

Fee received SHS.500.00



Applicant's Signature

FOR: M.O.ONDIRKI

Permanent Secretary
Ministry of
Science and Technology

APPENDIX 3: RESEARCH AUTHORIZATION

MINISTRY OF SCIENCE AND TECHNOLOGY

Telegram: SCIENCE TECH", Nairobi
Telephone: Nairobi 318581 ,
Email:psmst@education.go.ke
When replying please quote

JOGOO HOUSE "B"
HARAMBEE AVENUE
P.O. BOX 9583-00200
NAIROBI

29TH JUNE 2007

Ref.No: MOST/ 37C 380/2

Stephen Njoroge Karanja
Egerton University
P.O. Box 536
NJORO

Dear Sir

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on, ***'The Influence of Solid Waste Management on the Livelihoods of the Urban Individual Actors: A Case Study of Nakuru Municipality'***

I am pleased to inform you that you have been authorized to carry out research in Nakuru Municality for a period ending 30th November 2007.

You are advised to report to the District Commissioner and the District Education Officer Nakuru and the Town Clerk, Nakuru Municipality District before embarking on your research project.

On completion of your research, you are expected to submit two copies of your research report to this office.

Yours faithfully

M. O. ONDIEKI
FOR: PERMANENT SECRETARY

Copy to:

The District Commissioner
Nakuru District

The District Education Officer
Nakuru District

The Town Clerk
Nakuru Municipality
Nakuru

EULIB
082546