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THE ROLE OF COMMUNITY PARTICIPATION
IN RESIDENTIAL SOLID WASTE
MANAGEMENT: THE CASE FOR THE
URBAN POOR - NAIROBI.

BY

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DECLARATION

I, Protasio Mutuma Mbui, hereby declare that this thesis is my original work and has not, to the best of my knowledge, been presented for examination in any other university.



Sign

9/11/95

Date

This thesis has been submitted for examination with my approval as University supervisor.



Dr. George Ngugi

10.11.95

Date

DEDICATION

To my beloved Family, Parents, Brothers and Sisters for their constant assistance and encouragement.

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A special vote of thanks is due to the Government of Kenya through the Ministry of Lands and Settlements for sponsoring me to undertake the post graduate course in planning. I record with gratitude the contribution of Dr. Ngugi. As my research supervisor, he guided the study to the end. His positive criticisms and painstaking guidance have purged this thesis most of its errors.

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This study has benefited immensely from contributions of many organisations and individuals, some unknowingly. I record their vital contribution with gratitude. I also owe my gratitude to all my family members and Mr. Thambura for their constant inspiration and encouragement.

I owe a very special debt to my wife, Margaret, who not only suffered my prolonged preoccupation with this work, but at the same time continued to handle the welfare of our son, Mawira. Without her involvement in this manner, I doubt whether I would have made much headway.

While I recognise the contribution of all the above people, I remain responsible for the ideas, opinions and analysis that follow in this study.

ABSTRACT

This study discusses the reduction of the Nairobi City Council activity through the participation of the community in the solid waste management. It has been presented in the order of a detailed introduction, literature review and conceptual framework, data analysis, recommendations and conclusion.

The study critically examines residential solid waste management activities by the community in Mathare Valley and Korogocho slum settlement areas in Nairobi city. According to the study findings solid waste disposal by Nairobi City Council especially from slum settlements is deteriorating year after another.

The study also established that the community based organisations (CBOs) are faced with a number of problems (such as low participation level by the community, inadequate market for the compost and the unhealthy working conditions) which limit their effectiveness in waste management. The study consequently gives the appropriate recommendations on how the problems can be solved or minimized.

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CHAPTER ONE

INTRODUCTION

1.0.0 Introduction

With the rapidly growing metropolitan areas in the Least Developed Countries (LDCs), there is a concomitant growth in a variety of by-products of urban life. One of the principal limits to the sustainability of the towns and cities is the disposal of some of these by-products such as solid waste, (Khadaka, 1988). In Nairobi, the Nairobi City Council (NCC) collected only a quarter of the nearly 340 thousand tonnes of garbage generated in 1992, (National Development plan - 1994-1996).

According to the National Development Plan of 1994-1996, the most severely affected are those large slums where uncollected solid waste is a major cause of the high rates of diseases, disabilities and deaths, especially among the children. Generally, the quantities of solid waste are on the increase causing an enormous strain on disposal facilities. Thus, although cities are seen as the engines of economic development, failure to manage the impact/ of rapid urbanization is threatening human health, environmental quality and urban productivity.

Due to recent technological development and scarcity of resources, some solid wastes like organic material, plastics, scrap metals and bottles need not be seen as a problem to be disposed of, but as a resource for sustainable development. This calls for non-conventional approaches and practices in the management of the solid waste. Incentives for the reduction and separation of refuse at the point of production, decreasing the volumes of waste destined for sanitary

landfills and rubbish dumps, encouraging re-use and recycling, integrating the community and adopting appropriate technology in disposing the waste constitute elements for an improved environmental management services and job creation especially to the urban poor.

The current interest in the quality of the urban environment is a convergence of two evolving public concerns: the quality of natural environment: land, air, water and other resources; and the development of our urban communities. In addressing the problem of urban environmental degradation, we will inevitably find other problem areas that would benefit from the solutions of implementing prevention of environmental damage. For instance, the participation of the local community in the solid waste collection and recycling (through proper methods so as to avoid health dangers in handling the waste) not only reduces the amount of waste, the land area used for the storage of the waste and pollution; but also serves to generate employment in the areas of waste collection, sorting, transportation, processing, recycling and selling of the waste components and its by-products.

Community participation can be enhanced through solid waste management-sensitisation programmes giving various categories of the community the guidelines on how to participate in cleaning up the environment. Of late, community participation has taken a significant role as a strategy in social development generally, especially in the field of human settlement. This has come about in developed and developing countries as well.

In Kenya, however, community participation is not a new concept, especially in the rural areas where it had been in practice in form of self-help organisations, (NEAP 1994). Community participation means people's involvement in the

identification of their felt needs, mobilization of their resources, influencing direction and execution of environmental programmes and projects, (HABITAT, 1989). Through community participation in the solid waste management, the city residents can significantly supplement the waste management efforts by NCC which is already incapacitated by financial constraints. Such a scenario holds great promise not only for meeting the basic human settlement needs but also for elaborating an active and cooperative mode of development.

The main solid waste management issues addressed are, storage of the waste at the source, the organisation of collection and transportation and resource recovery. These techniques require a certain level of community participation; either the local residents, NGOs (both profit and non-profit oriented), and the waste collectors.

Usually, Municipalities view solid-waste management problem as purely stemming from lack of equipments; deficiencies in technologically advanced compactor trucks, hydraulic - compressor containers, transportable containers, and transport vehicles and their maintenance. In developing countries, over reliance on such technically sophisticated equipment is not desirable because when these equipments break down the entire system fails because of insufficient technical services, spare parts and fragile maintenance budgets.

1.1.0 Statement of the problem

Day by day, the Nairobi residents are being faced by an increased solid waste menace. Solid waste in most parts of the city estates still remains uncollected despite efforts by the Nairobi City Council and recently National Youth Service workers to keep the city clean. In most estates, heaps of

garbage await collection since the few workers involved in the cleaning cannot effectively do the job, (Daily Nation, Thursday, January 5, 1995). The problem of solid waste is compounded by rural-urban migration, poor planning and low capacity in local authorities to manage the waste. This has resulted into a serious problem threatening human health and causing environmental degradation.

In low income areas, solid waste collection service is very poor, the commonest mode of disposal being cleaning between dwelling structures, (NEAP, 1994). In these settlements, the amounts of waste produced continue to increase not only in terms of pounds per person per day but also in the volume, (Jackson, 1989). Here, health and environmental quality are being threatened by excessive dumping of the waste on open spaces and road reserves.

Often slum settlements comprise a sizeable proportion of the city's area and population - as much as half in many cases. As the urban population grows, capital requirements increase, but approved public expenditures represent absolute decline in available resources per urban residents, (Ondiege and Syagga, 1990). The onus of providing solid waste management services often lies with local government, and their/ fundamental deficiency is the failure to raise sufficient funds to provide an acceptable level of service. Even the limited funds available are used to acquire inadequate, often, inappropriate collection equipment or to maintain an insufficient, obsolete collection fleet, (HABITAT, 1993).

While there is considerable documentation on innovative community-level solid waste management programmes in Asia and Latin American cities, little research has been done on the importance of, and potential for, waste recovery through community participation in African cities. As a fast growing

city faced by solid waste menace, Nairobi possesses both the need and potential for an innovative approach to the waste management.

Unless Nairobi residents participate in the environmental clean up, the NCC alone will most probably not succeed in ridding itself of the heaps of solid waste to be disposed. This is because more than 50% of the solid waste generated in Nairobi is not collected, (Mwaura, 1991).

Solid waste handling services by NCC in Nairobi have been deteriorating for some time. In early 1970s more waste was collected than it is today although the population and waste production has increased. The financial limitations of the NCC is the major road block to provision of effective infrastructural services. Thus the waste management approach requires the intervention of many actors including: Municipal administration, households, community based organization and small scale enterprises.

Mathare Valley and Korogocho were selected as study areas because solid waste is a common problem and the local initiatives are being enhanced there. Like in other slum settlement areas rarely does the NCC provide waste disposal services there. Lack of access roads into these illegal settlements and difficulties in organising an efficient primary-collection systems further deter the NCC from collecting and disposing the waste from these areas. Also the limited capacity of low-income urban communities to pay for urban services and the fact that majority of these communities pay little or no municipal taxes have often been used as arguments not to serve these communities, (HABITAT, 1992).

A wide spread problem which continues to make solid waste management services ineffective in developing countries is the use of inappropriate technology for waste collection equipment. Waste collection vehicles designed for a particular location can be unsuitable for another. For example, waste-collection vehicles designed to operate in low-density urban areas with well paved roads might be totally unsuitable to handle high density areas with poor access, although the two areas might be in the same city. There has been a problem to standardization of city-wide collection fleet. This trend has resulted in excluding large areas of cities from solid waste disposal service. This is the case in Nairobi whereby the collection vehicles are unable to operate in slum areas due to inaccessibility, (HABITAT, 1988). In such areas, human drawn carts could be relied upon as far as solid waste collection is concerned.

In Nairobi, at the city centre, a high degree of paper collection exists. Waste collectors have fixed places (street corners and parking lots) to which some office people bring used papers. However the collection operations of the waste are entirely private and uncoordinated. Officially, it is not allowed, with the effect that regularly the police harass the waste collectors. The collection of materials for recycling by the waste collectors also take place at the Dandora landfill and also in residential areas to some extent. Legalization of the collection points will not only improve the collection but also allow small shelters to be erected against sun or rain, so that working conditions of the waste collectors may improve, (HABITAT, 1993). Usually the waste collectors sell their collected recyclable materials to the middlemen who in turn sell to the few available recycling industries which include, Chandaria and Madhupaper for paper component and Emco industry for scrap metal component. Besides, there are *Jua-Kali* artisans from Gikomba and Dandora

who buy some of these waste components especially scrap metals and tins.

Rural households tend to handle materials of all kinds very frugally and to use most food wastes as animal fodder. Such is however not the case in urban households, and some means of waste storage, processing and disposal becomes necessary. Therefore sound solid waste management in urban areas is essential.

1.2.0 Justification of the study project

There are very few studies that have been conducted on solid waste management in Kenya. Perhaps this can be explained to some extent by the fact that it is in recent past that the magnitude of the waste problem has attained uncontrollable proportions in the major cities, hence attracting the public attention.

Higher proportions of the city population will continue to seek for housing within the low income areas as the level of urbanization and inflation rises, (Kiogora, 1993). Given the fact that government resources are limited and can not be expected to effectively manage the urban environment, other sources of support apart from the NCC's should be sought so as to attain a sound urban environment.

Like many cities in developing countries today, Nairobi is producing solid waste at a rate which outpaces the capacity of the NCC to collect and dispose it, hence current approaches to waste management are neither effective nor sustainable, (HABITAT, 1994). Many developing countries are heavily dependent on imported hardware and expertise and large amounts of foreign exchange are spent in the provision of solid waste management services.

United Nations Centre for Human Settlement (HABITAT) has already undertaken technical assistance in several countries in Africa, including capacity-building for waste management in Dar-es-Salaam, Tanzania which considered privatisation of refuse collection services. In Nairobi, Kenya, the HABITAT has initiated a demonstration of small-scale composting of the organic fraction of the municipal refuse as part of their global project on small-scale composting, (HABITAT, 1994).

Revenue collection for municipal services such as waste management is often poorly managed with the cost recovery being far less than the true cost of waste disposal. This study mainly focuses on the programmes to stimulate recycling and reuse, addressing appropriate technologies for increasing service coverage, and ensuring environmentally sound waste disposal through community participation. The above action areas are the central theme of the United Nations (1992) report on sustainable development, Agenda 21's chapter on waste management.

Community participation (CP) in managing the waste can significantly help in reducing the urban environmental pollution. In addition, solid wastes properly managed, are a potential resource for recovery of materials, for composting and job creation. Through community participation, governments and local authorities despite limited outlays in per capita support, can assist a far larger number of the needy than can be reached by current conventional programmes, (HABITAT, 1987). Such concept is based on a full understanding of the need for partnership between all the actors which can be involved in solid waste management system. By involving communities in designing and creating support programmes, public authorities such as social welfare department, and planning officers benefit because this

broadens their resource base in physical, financial and most important human terms.

Studies have shown that local residents are willing to dispose the waste by themselves rather than wait for the Council's collection vehicles which take long or are never seen at all. AMREF's projects in poverty areas have demonstrated that residents are willing to participate in cleaning up their neighbourhoods and are willing to share some of the costs, (Davinder, 1987).

1.3.0 Objectives of the study

These specifically will include:

- i. Assessing the ability of NCC to manage solid waste in Nairobi.
- ii. Evaluating alternative community based solid waste management strategies among the urban poor in Nairobi.
- iii. Assessing the problems encountered by the community in slum settlements in their effort to dispose residential solid waste.
- iv. Making policy recommendations on how to, make solid waste management in Nairobi efficient through community involvement.

1.4.0 Assumptions of the study

This study is based on the following assumptions:

- i. that solid waste menace will continue to pile up especially in low income areas if the services of the Nairobi City Council continue to be relied on.

- ii. that success of the solid waste management in Nairobi will depend on the local community participation and adoption of appropriate technology
- iii. that residential solid waste management through community involvement is faced by various problems which ought to be tackled if the waste management through this approach will be improved

1.5.0 Scope of the study

This study examines the role of community participation or involvement in residential solid waste management in Nairobi with the special emphasis to the contribution of the urban poor in the slum settlements. The data was mainly collected in Mathare Valley and Korogocho slum settlement areas in Nairobi. In addition the data was also gathered from various other parts of the city though to a lesser extent.

There are various types of solid waste which may be differentiated by their origin, physical form, and detailed composition. This study pays special attention to residential waste which is part of municipal solid wastes that are generated by household and commercial activities. It mainly deals with solid waste management in residential areas and excludes other types of municipal waste which include liquid and industrial hazardous waste.

There are various types of residential solid waste based on source categorization. These include:

i. Household garbage and rubbish

This is composed of wastes that are the consequence of household activities. This is sometimes referred to as residential refuse or domestic waste.

ii. Market Waste

In developing countries markets contribute a

significant portion of the organic waste. This is because the markets are dominated by small scale vendors running kiosks in open air market which do not have adequate refuse storage facilities.

iii. Institutional refuse

This include refuse which is generated from institutions like schools, hospitals, religious buildings and other institutions.

iv. Construction and demolition debris

These include stones, wood and any other material used in construction. Activities related to small buildings contribute significant quantities of waste to the municipal refuse.

v. Sanitation Residues

This is particularly common in the slum areas where sewerage is not the major means of managing human excreta.

The study examines various ways by which various sections of the community are employing (or can employ) in managing the waste. Recycling is given attention hence various recycling approaches are identified. Recommendations on how to achieve effective and efficient solid waste management in Nairobi are given. The role/responsibility of various actors (households, neighbourhoods, community based organisations, waste collectors, private profit making enterprises, NGOs and the NCC) in the solid waste management is outlined. This sets integrated strategies in the waste management.

1.6.0 Research methodology

The research study utilised both primary and secondary sources of data collection methods. The secondary data were obtained mainly through literature review of the existing work by academicians and researchers on urban solid waste management. Other sources of secondary information included government

publications, maps, and other documents that were obtained from relevant government offices.

Primary data were gathered in the field mainly through observation and administration of household questionnaire and by the use of interview schedules. This involved visiting the solid waste managing groups in their projects' sites. Extensive discussions were made with these groups. Through this the researcher was able to get insight of the operations of the projects and to appreciate the shortcomings and future prospects for these small scale solid waste management community initiatives. In addition, this enabled the researcher to interact with the community and to get the people's views as freely as possible about their expectations of the NCC in solid waste management, attitudes towards solid waste in terms of resource recovery, and knowledge on potential uses of the waste. Also informal interviews were conducted with key informants (Officers of NCC, Ministries of Health, Environment and Natural Resources; National Environment Secretariat) and the solid waste collecting profit making enterprises. Photography was also used as a primary data collection method.

The data analysis methods used include the descriptive statistical methods like percentages and averages. Cartographic representation such as maps, tables and pictorial presentation are also used.

1.7.0 Study limitations

In the course of conducting the study, the following problems were experienced:

There was lack of relevant data in the NCC documents on solid waste management in the study areas in particular and the

whole of Nairobi in general. The bulk of the information available was outdated.

Also it was very difficult to get information from the NCC because of the then personnel conflicts in the council. The NCC officials kept on promising to attend to the researcher every following day and consequently this led to waste of a lot of time.

In addition, the data collection period was very short (two months). This was not adequate for collection of a comprehensive and detailed information. More so, some respondents had a tendency of answering some questions untruthfully. For example, some were depicting their expenditure as higher than their income which is naturally not tenable. A lot of time was spent in trying to cross-check and to prove the respondents in order to generate very accurate information.

Some of the community based organisations engaging in waste management like organic waste composting were not willing to cooperate as they claimed that they could not see how the study would help them. So they felt that their time was being wasted by the researcher when interviewing them. Financial constraints proved another major limitation of the study.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.0.0 Introduction

As the urbanization growth rate is rising rapidly in the developing countries, solid waste has become a common phenomenon in the major urban centres especially in the low income residential areas, (Syagga, 1992). The rate of waste accumulation is so high that the municipal councils are finding it difficult to provide effective and efficient solid waste management. As a result the environmental conditions in these areas are appalling. Nairobi is one of the cities experiencing such conditions as the waste collection service does not serve 55% of Nairobi's residents who live in slum areas which cover 5% of the Nairobi area, (HABITAT, 1994). Perhaps due to the fact that it is in the recent past that the waste management has become a total environmental problem, only a few solid waste management studies have been conducted in Nairobi and even the ones which have been done, give a scanty attention to the role of community participation (CP) in the solid waste management.

2.1.0 Literature review

The problem of solid waste has attracted the attention of scholars. One of the studies which recognise the role of the CP in the solid waste management has been carried out by HABITAT (1989), in Nairobi. The study notes that the urbanization of developing countries and the growth of spontaneous settlements are taking place on such a rapid scale that national and local governments cannot cope with the demand for decent shelter and environmental conditions hence existing municipal services such as solid waste disposal

rapidly deteriorate. According to the study this is likely to be seen as a problem of inadequate means of transport, as far as the municipality is concerned. However, the study does not provide a guideline on how to harmonise various actors like the households, community based organisations (CBOs), non governmental organisations (NGOs) and private sector into solid waste management; which is the concern of this study.

According to the HABITAT's workshop (African Waste Forum, 1994), many cities are today producing waste at a rate that outpaces the capacity of local authorities to collect and dispose it in a safe and efficient manner. The workshop noted that:

- a. Many developing countries are heavily dependent on imported hardware and expertise hence large amounts of foreign exchange are spent in the provision of solid waste management services.
- b. Revenue collection for municipal services such as waste management is often poorly managed.

It was noted that in the longer-term, effective implementation of sustainable waste management practices should be aimed at:

- a. Methods of reducing the production of waste at source;
- b. Programmes to stimulate recycling and reuse;
- c. Addressing appropriate technologies for increasing service coverage and;
- d. Ensuring environmentally sound disposal methods.

These four action areas are the central themes of the United Nations' (1992) report on sustainable development - Agenda 21's (chapter 21) on waste management. The common theme of the workshop, (ibid), was that many of the environmental problems facing cities in developing countries could be reduced by a greater awareness of the population with regard to the

satisfactory collection and disposal of refuse. It was asserted that neither the public nor the private sector can provide an efficient refuse collection service without the active participation of the households and the local communities. One way of achieving this, it was agreed is that through running campaigns focusing on primary storage, illegal dumping, community managed collection schemes, environmental pollution, disease, recycling and reuse among other things. This study is based on the same feelings and the assumption is that incentives and a reorganization of waste management procedures, including CP, is more likely to provide durable solutions to the solid waste problem than purely technical approaches.

Syagga, (1992) point out that less than 50% of the refuse generated in Nairobi is collected while the rest remains scattered and rotting in the open spaces, open drains and road sides. He recognises the importance of integrating local community into the solid waste management. Syagga also recommends a research to determine most appropriate waste collection methods that promote use of community resource base, utilising informal sector and appropriate technologies. He says that municipal authorities should remain responsible for maintenance of municipal dumps, establishing a system of guidelines and standards, monitoring compliance with guidelines, and spearheading campaigns for public participation. He further argues that waste management requires the intervention of many actors, including community based organisations and small-scale enterprises. This study is based on the same ideas.

Mwabe, (1993) argues that a well designed municipal waste incinerator can be the hub of a vigorous, private sector run, waste handling system with the municipal authority concentrating its efforts in enacting and enforcing waste

disposal by-laws. He says that a major problem of waste handling and disposal in Nairobi is the lack of efficient collection and safe methods of solid and liquid wastes disposal. He also argues that the increasing demand for land by the urban population will continue to put further pressure on the land sites available for open dumps. However, he does not recommend any appropriate local technology. He recommends erection of an incinerator but this could be very expensive as compared to the systems of the resource recovery and organic waste composting by the community, private sector and NGOs. Instead of burning organic solid waste, it can be composed to provide manure which would promote urban agriculture.

In his study, on The Proposal for Cleaning the Nairobi City, Mecca, (1989) recommends that Nairobi city council adopt high technology in its domestic waste collection, transportation and disposal efforts. This called for importation of highly efficient capital equipment such as compactors and trucks which are mainly used in developing countries. However as far as the imported equipment is needed there is need to use local appropriate technology (for example, handcarts) which can be effective in local social and economic conditions. This study pays attention to community participation in the waste management system, local needs, income levels, unemployment situation and technology adoptable to the local situation, when examining and searching for effective solid waste management practices.

The effectiveness of solid waste disposal system and the cost of operation depend to a great extent on the cooperation of the householders in providing proper containers, preparing and storing the refuse in accordance with regulations, and regularly placing the material for collection. Public education therefore is the most effective and economical means of securing the assistance of citizens. The above views were

expressed by the "Committee on the Solid Wastes American Public Works Association - 1966". About 30 years later I share the same feelings that solid waste management should follow this approach.

A report by the World Watch Institute (1987) points out that in most areas of the world the ability to manage waste effectively lags far behind its rate of growth. The report embraces community participation (CP) in solid waste management and gives examples of a number of Chinese cities like Beijing, Shanghai and Tianjin which are trying to cope with garbage piles through CP and informal sectors. The report recommends recycling program which would save money by reducing disposal costs and by selling recycled and recovered materials. This approach can be emulated by African cities.

Experience from other parts of the world confirms the economic importance of scavenging activity. The household economy of the poor including scavengers, and community based systems of waste recovery and recycling account for most of the solid waste management of Asian cities, (Furedy, 1989). According to her, some analysts and even public officials have observed that without the preserve "waste economy" of scavengers and the urban poor, environmental deterioration would be much worse in most cities. She argues that the problem, therefore is not one of how to control or get rid of the poor, but how to provide them with positive support both in terms of heightening access to environmental resources and in improving their efforts to cope with the environmental conditions of their households and communities. She notes that overcoming the environmental obstacles rests, in the first instance on community mobilization and empowerment.

The study carried out in Indonesia by Vorsnol, (1982) recommended that measures adopted towards scavengers should aim at their total integration into the urban society since they benefit both the urban and the national economies. Therefore there should be an institutional set up which would bring together all the actors including Municipal authorities, private sector (both formal and informal), local residents and NGOs.

In an attempt to tackle the problem of solid waste, African countries can have a leaf to borrow from most Asian cities, where a substantial amount of interest has been generated over the past several years enhancing CP in the planning process. The common theme is that citizens at the neighbourhood and community level can, under supportive conditions manage waste disposal systems.

However, Diana (1992) notes that translating the reality of urban life for poor into active communities faces innumerable obstacles. She notes that rural community support systems are weakened in the urban context where neighbourhood continuity may be low, social stratification is high, dependence on the market for much of the household consumption demands constant involvement in the search for wage work which erodes reciprocal and redistributive relations. But there is a likelihood that social mobilization at community level is most likely to occur and achieve goals in settings in which people have a sharpened sense of shared destiny. In Eckstein's study of an effort by the urban poor in Mexico to obtain housing, the key factors identified for the success of their housing movement were shared economic deprivation and a common sense of limited alternatives. Therefore, the pessimism suggested due to the observed deterioration in community relations and networks should not lead to a rejection of efforts to promote community empowerment and citizen activism. The very

engagement of people in cooperative efforts can promote the type of awareness needed for consensus-building for further action. Furthermore studies have shown that even heterogeneous communities can muster the collective will to address common issues.

According to Wilson (1981), the residuals of human activities ought to be recycled, reclaimed or reused. Thus careful planning and control of waste management is required. However this can be only achieved if local authorities are going to consider community organisations as their partners in the management of the waste.

The provision of urban services in Kenya has largely been the concern of the Local Authorities. But in the last 15 years or so, there has been a growing contribution from non governmental organisations (NGOs). NGOs in Kenya can be traced back to the colonial days when they were mainly charitable or religious organisations working with destitute in urban areas. In the 1980's NGOs started to tackle development related issues, and have since been increasingly involved in major socio-economic programmes, (Kobia, 1987).

In Kenya NGOs are participating in a wide range of activities like in environment, health, food and nutrition, energy, water, sanitation, shelter, agriculture, education and training, recreation, family planning and women. Non governmental and community based organisations and other sources of social support outside the community have come to play a critical role in citizen and community mobilization. Another perspective on the roles of NGOs concerns more technical assistance related to skills, information, access to technical inputs, and monitoring and evaluation, (Eckstein, 1989).

In Nairobi various non-profit making NGOs have ventured in the field of solid waste management through community participation. These include Undugu Society of Kenya. Over the years of operating in informal settlements, Undugu Society realised that the street children and the slum communities depend on waste for employment and income generation, (Undugu Society of Kenya, 1994). Consequently, the Society embarked on integrating waste recycling into ongoing community development activities such as basic education schools, and urban gardening. The activities revolve around briquetting paper into fuel, use of plastic for trimmings in the Coca-cola drink coolers and candle making using reclaimed wax. The interventions in community development are geared towards self-reliance and acquisition of affordable technologies by the collaborating groups.

Uvumbuzi club, an essentially environmental organisation, is also integrating the local women at Dandora and Korogocho into an organic solid waste management project through composting. The members of the organization and the public at large are invited to visit the composting site for demonstration purposes. However the market for the product is limited hence there is an urgent need to look for a wider market.

Non governmental organizations have proved to be very useful as intermediaries through which government and municipal agencies or bilateral and multilateral funding agencies can reach low-income communities. Perhaps the outstanding example of this is the First El Salvador Sites-and-Service Project, (Lawrence 1990). A local non profit organization, utilized community participation as its primary mode of action, with the goal of developing communities rather than simply generating mass housing for them. It collaborated with low-income families in developing a housing project in which the latter has to participate actively, not just through contributing mutual aid and self-help labour but also through

taking responsibility for the management of the emerging and resulting community projects. Though the project did not mainly focus on solid waste management similar organisation can be copied in the management of solid waste in Nairobi.

In most large Asian cities, one can find an NGO project that has something to do with the collection and/or recycling of solid wastes. Usually these projects started with the wish to assist waste collectors improve their earnings, health, living conditions and security or to help small entrepreneurs working in recycling. Cooperatives of the waste collectors are encouraged in order to improve their bargaining power vis-avis the waste dealers, (Diana 1992).

In his book called "Privatization Decision", Donahue J. D. (1989) looks at the extent to which some government activities can be turned over to private businesses. According to his study, the Nairobi City Council (NCC) cleansing department is under financed. The cleansing service is supposed to be financed mainly from General Rate Fund but this has been showing an increasing deficit over the years. The overall NCC deficit has been increasing at about \$ 10 million per year, (Urban Perspectives Vol. 1. No. 3, 1991), hence the need of departing from reliance on the NCC in the provision of waste management services.

Mwaura (1992) found out that due to the inability of NCC to provide the required standard of garbage disposal services 85.7% and 76.2% of households in Plainsview and Dandora areas respectively expressed willingness to have private garbage handling services introduced there. But whereas 88.9 % of Plainsview household can financially afford to pay for the services (Ksh. 140 per month) only 19 % of Dandora households can afford. The question of affording to pay for those services is related to the income levels of households.

Consequently, private solid waste collecting companies have in the past expressed preference of the high income settlements.

Both the Public Health Act (CAP 242) and the Local Government Act (CAP 265), Kenya constitution, remain silent on various activities related to solid waste management. There is no provision as to the nature of storage facilities, and extent to which the refuse collection service should be offered, and how far the local residents should participate in the activities of making the urban centres environmentally sound. Therefore there is need for a thorough review of the legal framework of the local authorities in order to accommodate and incorporate these aspects.

Private waste disposal has succeeded in other parts of the world. Waste collection in Cairo with an estimated population of 10 million inhabitants, is entirely in private hands and largely financed by the recovery of waste materials from waste products. Street-sweeping is a municipal service, but the collection of household refuse and its disposal are undertaken by two private groups. The transport system is based on donkey carts which take the waste from all neighbourhoods to six *Zabbaleen* (slum) settlements around Cairo. The markets for practically all waste material are available and they discard only 15% of the original waste volume on their dump sites. The effective sorting of the recyclable material by the slum dwellers has promoted the development of commercial and industrial network based on the supply of raw materials extracted from waste items. Ultimately, all costs of waste disposal are paid for by residents in one form or another.

In Juarez city, Mexico, a cooperative effort among waste collectors has not only created economic independence for its members but also replaced traditional practices of waste

recycling in Mexico. Waste collectors work together and to sell recycled products, their cooperative, "The Cooperative Society of Material Recovers", must enter into a complex world of commercial relationships that range from establishing prices, looking for markets, meeting clients and administration of profits. This organization, besides providing a regular income and permanent work, enables other important social services to be planned and financed, cooperatively such as education and medical services for both workers and their families, (Carl, 1992)

Preliminary case studies on private sector provision of municipal solid waste services in 4 large American cities, (Buenos Aires, Caracas, Santiago and Sao Paulo) established that private service provision can be successful in terms of cost, containment and quality of service as long as the conditions for contestable markets are met. In the 4 case studies private collection firms have exclusive right to service specific areas of the city and contracts are awarded by competitive bidding.

These and other studies in the region suggest that local authorities should establish operational and environmental regulations and standards to guide private contractors, and have the capacity to oversee these activities. In Curitiba city, Mexico, Municipal solid waste collection has been contracted since 1984 through a public competition to a private company, LIPATER. This company has some 1,300 employees and is also responsible for street cleaning. The City Council retains a staff of 150 for management and supervision of these services, (Carl 1992).

Asian cities have extensive "Waste economies", structured through waste buyers, waste pickers, small waste shops, second hand markets, dealers, transporters and a range of recycling

industries. In seeking adjustments between municipal solid waste disposal systems and informal practices, proponents of the non-conventional approaches, usually seek some regularization and improvement of these practices, (Diana, 1992).

Over reliance on foreign technology is one of the factors cited as hindering effective solid waste management in most cities of developing countries. In Indonesia, the Bandung Urban Development Project is an example of a project applying inappropriate foreign technology. A team of foreign experts focused on the transport aspects of waste disposal and introduced expensive compaction trucks which picked up the waste from transfer stations, where it had been brought by handcarts. The compaction did not reduce the waste volume very much because of the characteristics of the waste. What the compaction truck did, however, was to crush the glass so that manual waste separation became almost impossible, (HABITAT, 1987). The HABITAT (ibid) recommends human powered collection equipment which includes push carts, bicycles, and wheel barrows. This technique is particularly appropriate in areas with limited access and does not rely on expensive fuel, maintenance and spare parts. This approach would be appropriate in Nairobi where not only the slum areas are inaccessible but also the funds for this service are scarce.

2.2.0 Summary

The foregoing discussion demonstrates that:

1. Nairobi City Council and Municipal authorities can no longer be relied on to offer effective management of the solid waste;
2. Community participation could be an alternative approach in municipal solid waste management;

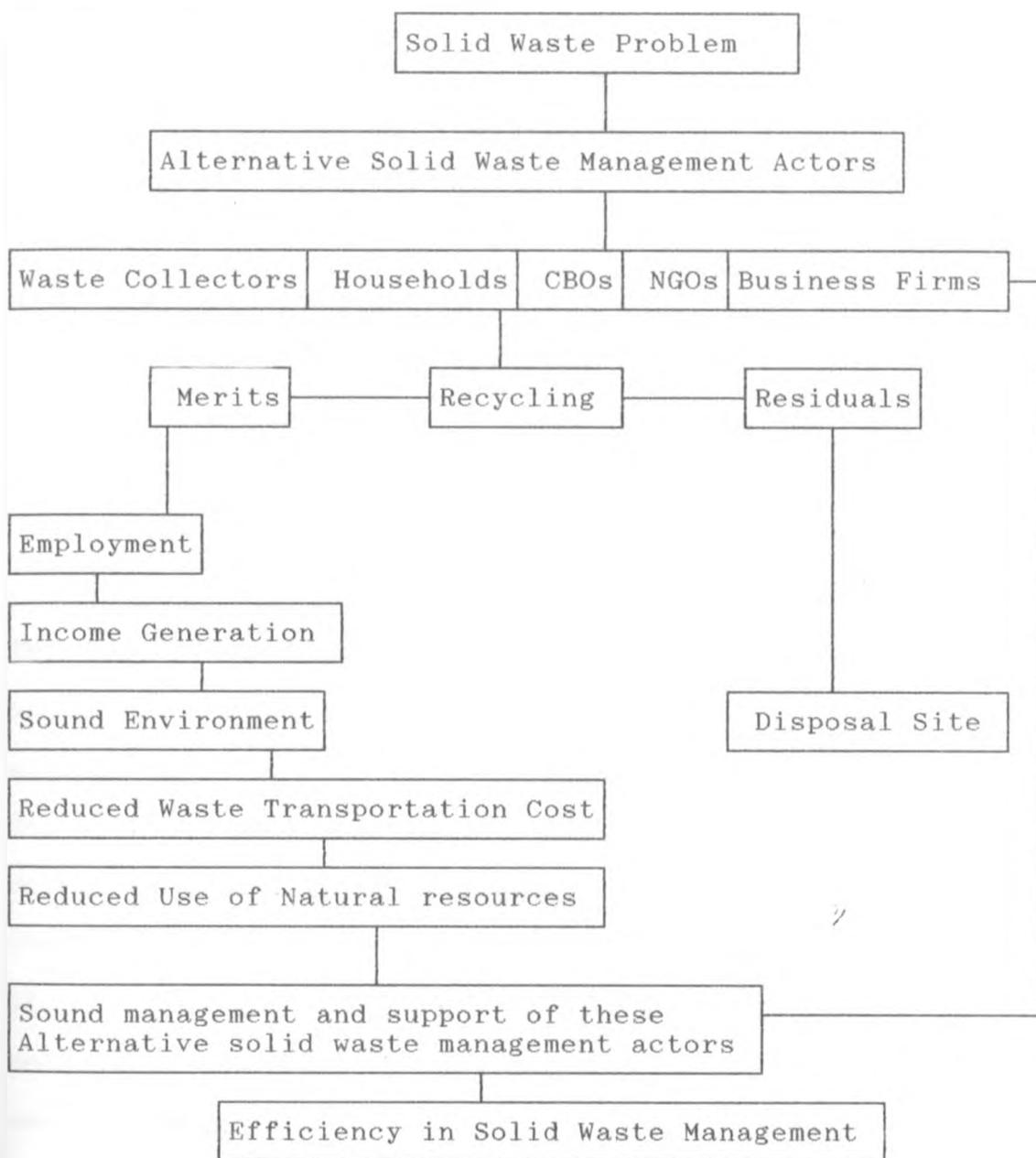
3. Community participation has succeeded in other parts of the world including developing countries especially in Asia;
4. Recycling, reuse and composting are the major methods of solid waste disposal recommended.
5. Developing countries should not totally rely on imported equipment in their effort to manage the waste. Rather they should incorporate appropriate technology in the waste management.

This study was prompted by the identification of the gap (lack of community involvement in the management of urban solid waste) left by the previous studies. This study is aimed at identifying the problems which hinder community involvement in solid waste management and giving recommendations on how the community effort can be improved to offer effective service in the waste management.

Waste management systems should integrate community participation more explicitly. Locally available technologies can ensure community level sustainability in the solid waste disposal. This study has also been prompted by the desire to have recommendations on how to integrate various community actors and Nairobi City Council in the municipal solid waste management.

UNIVERSITY OF NAIROBI
ADD LIBRARY

2.3.0 Conceptual framework



Source: Own derivation

Without community involvement in the management of solid waste in Nairobi, it will be difficult for the NCC to adequately deal with the solid waste problem. Where communities are confronted with a problem (in this case disposal of solid waste) and the agency charged with the responsibility of disposing the waste is not able because it lacks adequate resource - finances, manpower, equipment e.t.c, experience from low income residential areas shows that residents will organise themselves or organised by NGOs to dispose solid waste within their areas. These NGOs are the ones dealing with environmental protection, child care and general hygiene.

The conceptual framework illustration above shows that the solid waste management can be undertaken not only by NCC but also by other actors which include; households, CBOs, Waste Collectors, NGOs and profit making private firms. With relevant support and encouragement by NCC and other agencies these alternative waste disposal actors can improve efficiency of solid waste management in Nairobi. Recycling of the recyclable materials is considered as an integral part of the waste management. The benefits of recycling include; employment, income generation, sound environment, reduction in transportation cost and natural resource usage.

CHAPTER THREE

BACKGROUND INFORMATION OF THE STUDY AREAS IN RELATION TO THE SOLID WASTE PROBLEM

3.0.0 Introduction

This research study was mainly conducted at Mathare Valley and Korogocho slum settlement areas in Nairobi, (see maps numbers 1 and 2). These being typical slum areas (where solid waste is a serious problem) in Nairobi, makes a good representation of the many slum areas in the city which are experiencing the same problem. In the study areas and some other parts in Nairobi some community groups are already participating in making their environment clean. Most of these groups came about due to the initiatives of environmental-lobby non governmental organisations (NGOs) like Uvumbuzi Club. This study has primarily focused on identifying the methods and ways by which the residents (households, 'neighbourhood community etc.) can participate in cleaning up their surroundings through the use of appropriate technology in the process of the waste disposal.



LEGEND

STUDY AREA



MAP N° 2

0

STUDY AREAS IN REGIONAL CONTEXT

3.1.0 Growth of Nairobi

In terms of population and physical expansion Nairobi has experienced a rapid growth since 1895 when a depot for caravan trade was established at the present Ngara area. The growth accelerated when the Kenya-Uganda railway reached it in 1899. Nairobi was made the railways headquarters and soon afterwards became the colonial capital, in 1905. By the same year Nairobi had a population of over 10,000 people.

In 1920 Nairobi covered an area of 3.84 Km sq. and in 1919 when it was made a Municipal Council it had expanded to occupy 25 sq. km. Nairobi was given city status in 1950. By 1948 the town covered an area of 83 sq. km and at independence, 1963 the boundaries were expanded to embrace an area of 684 sq. This is still the current physical official area of the city. Meanwhile, the population grew to 118,976 in 1948 and in 1963 it stood at 350,000 people. It is estimated that from this time on, the population growth rate was between 7% and 9% per annum. Due to this high population growth rate Nairobi's population reached 830,000 people in 1979. From 1979, the population growth rate of Nairobi lies between 5 to 7% and according to 1989 population census the population of Nairobi by 1989 was about 1,325,000. It is estimated that the population of the city was about 1.7 million people in 1993 at an average annual growth rate of 7.5% (Obudho, 1992).

According to the foregoing, the growth of Nairobi had been

rapid in terms of area and population. This high growth rate is not expected to decline significantly in the near future. This means that the city infrastructural services such as solid waste disposal service will continue to decline if the services of the Nairobi City Council continue to be relied on. Since the Nairobi City Council is already unable to cope with the management of the solid waste generated in Nairobi, there is need to seek for the alternative which can be able to cope with this growth rate of the city. Community involvement in managing the waste could be one of the alternatives.

3.2.0 Functions of Nairobi

Being the capital city of Kenya, Nairobi is the centre of commercial activities. According to the Nairobi Socio-Economic profile of 1990, over the past 25 years, Nairobi city has experienced the construction of high rise commercial buildings in the commercial business district (CBD) and additional government offices on the Nairobi Hill ("Community"). In addition it has expanded with new industrial zones developed in Ruaraka and Dandora areas.

Nairobi is the primate city of Kenya thus more people resides here than in any other town in the country. Over the last 30 years, new residential settlements have been developed especially in the eastern and southern parts of the city. Due

to high rate of immigration, natural population increase, and lack of job opportunities the city has been unable to provide enough housing especially to the low income group. This has resulted in the unabated growth of spontaneous squatter settlements. Neither the public nor private sector have been able to provide adequate services and infrastructure to these settlements (Kenya Government, 19890).

Of all the towns in Kenya, Nairobi offers most job opportunities both in numbers and variety, ranging from formal to *Jua-Kali* sector employment. The high growth rate of Nairobi is in addition linked internationally by airlines through Jomo Kenyatta International Airport while Wilson Airport is meant for local trips within the African regions.

More so, Nairobi tops other towns in the Country in the provision of educational and cultural facilities. Not only the University Campuses are located here but, also quite a number of secondary and primary schools not even to mention the many professional colleges in the city. Social and cultural facilities are also numerous in Nairobi. In addition, Nairobi is administrative headquarters. It is the seat of the central government and all the government ministries have headquarters in Nairobi.

As indicated above Nairobi city has a wide range of functions.

These functions have attracted and still are attracting many people especially from the rural areas in search of job and social-cultural opportunities in Nairobi. This makes the city to have the highest population growth rate of all the urban centres in the Country.

The general urban unemployment rate has been 16.2% and is expected not to change positively soon, (National Development Plan, 1989/93), hence urban authorities will continuously find it difficulty to provide basic facilities to the urban population. It is with this background that alternative approaches of providing these basic services has to be sought. This includes community partnership with Nairobi City Council in the solid waste management.

3.3.0 Location and historical information of the study areas (Mathare Valley and Korogocho).

A. Mathare Valley

Mathare valley is located in the eastern part of Nairobi, about 4 miles from the city centre. Being a large uncontrolled shanty and squatter settlement, it comprises of 9 villages covering an area of about 157 hectares along 4 kilometres of the south banks of Mathare and Gitathuru Rivers, (Kiamba, 1986).

Mathare slum settlement started way back early this century. Between 1910 and 1920 Mathare area was sub-divided into plots of 0.5 to 6.0 hectares. These were acquired mainly by Asian businessmen who were interested in quarrying in the area. However, not until the end of 1930s that unauthorised African settlement started in the Valley. They started by renting illegal shanty structures from the Asians. Others squatted on any available vacant land.

From 1960s the population of Mathare grew from 50,000 to 60,000 in 1970. From mid 1960s squatters from the valley and also other people from without started forming companies and co-operative societies which helped them to purchase the land which some had been squatting on. These organisations had by 1971 bought about 40% of all the land in Mathare Valley slum area.

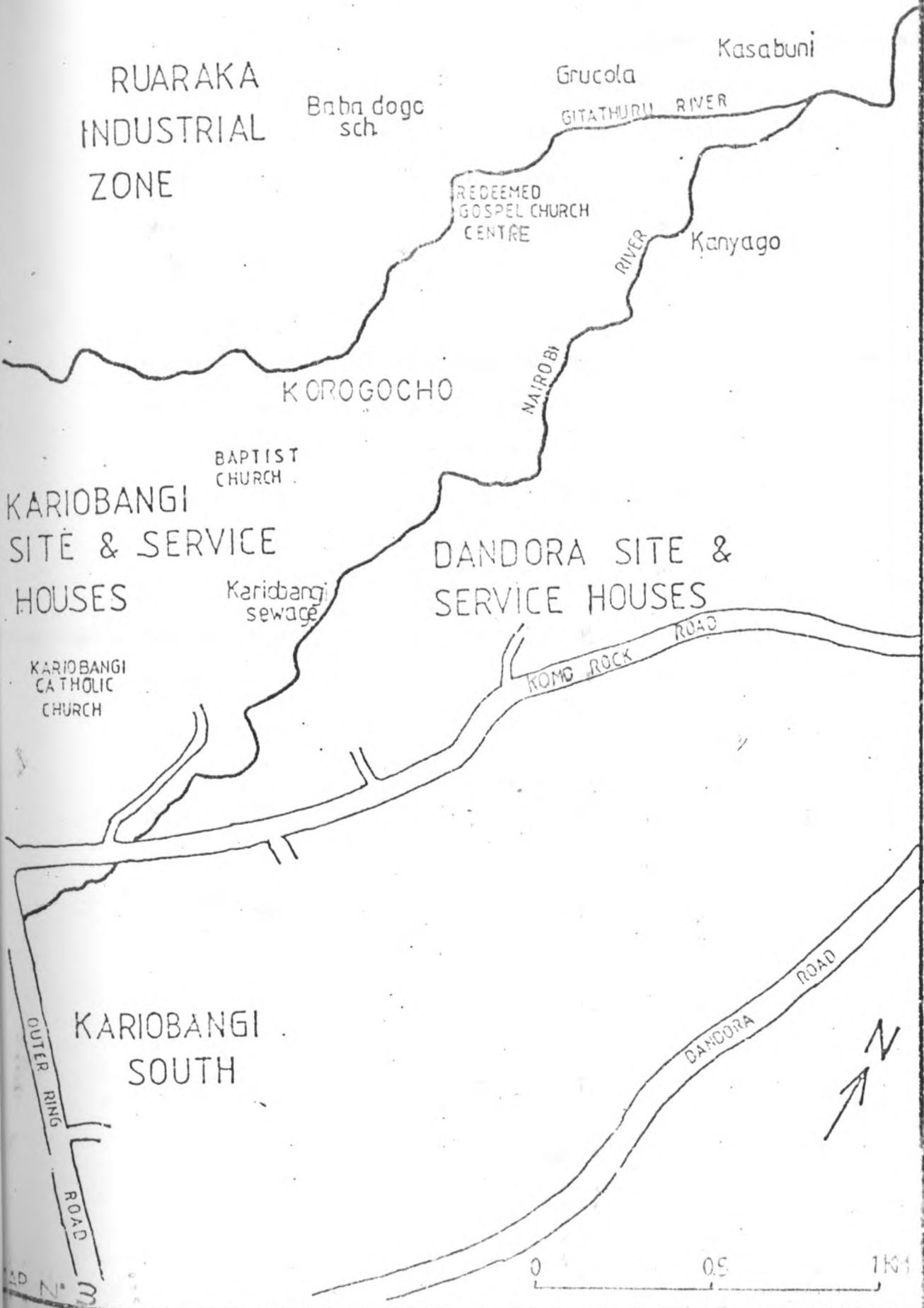
The companies constructed illegal dwelling structures which were rented to the low in-come earners. However due to the government policy of demolishing squatter settlements in 1970s many squatters were evicted. On May 1971 there was an intention to have "Mathare Valley Re-development Scheme" (Gazette Notice, 28 May 1971 The Kenya Gazette), for developing the area into an "hygienic decent and less crime-ridden housing estate" (The Standard, 8, July 1972). This did not happen as the move faced a lot of resentments hence the

land in question was withdrawn from the planned acquisition,
(Gazette Notice, 21 July 1978, The Kenya Gazette)

B. Korogocho

Korogocho settlement is located on the eastern side of Nairobi about 12 km. from the city centre. It covers an area of 40 hectares and it is situated on a ridge which separates Gitathuru and Nairobi rivers, (see map number 3).

Ruaraka industrial area and Kariobangi sewage works borders it towards north and west respectively.



RUARAKA
INDUSTRIAL
ZONE

Baba doge
sch.

Grucola
GITATHURU RIVER
Kasabuni

REDEEMED
GOSPEL CHURCH
CENTRE

RIVER
Kanyago

KOROGOCHO

NAIROBI

BAPTIST
CHURCH

KARIOBANGI
SITE & SERVICE
HOUSES

Kariobangi
sewage

DANDORA SITE &
SERVICE HOUSES

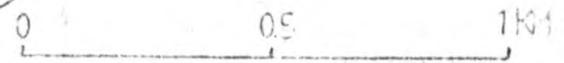
KARIOBANGI
CATHOLIC
CHURCH

KOMBE ROCK
ROAD

KARIOBANGI
SOUTH

DANDORA
ROAD

OUTER RING
ROAD

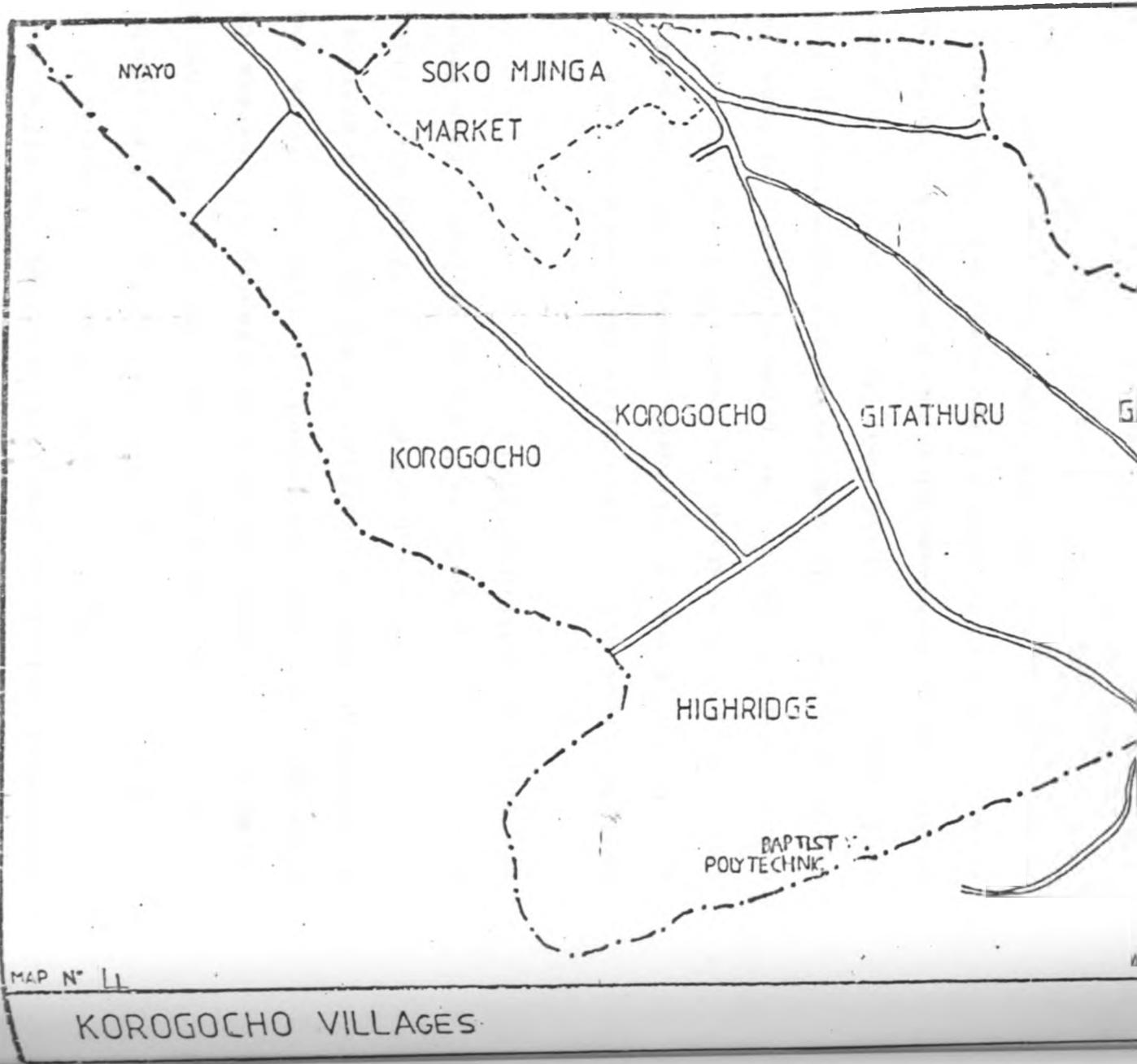


KOROGOCHO AND ITS ENVIRONS

Ngunjumu Village borders it towards south while Dandora estate forms the eastern border. Compared with Mathare Valley, Korogocho is a relatively recent settlement. Korogocho slum settlement was nonexistent around 1970. In 1970s a number of quarry workers employed in the surrounding quarries built temporary loose structures. These structures were initially far apart. Since the area was away from police surveillance, a few people started making illegal brews.

Korogocho derived its name from one first settler, a Mzee Kamau. When drunk Kamau used to exhort his friends not to torment him with questions and quarrels. As a result of this he was nicknamed "Korogocho" a kikuyu word meaning "I do not want quarrels or disturbances. Mzee Korogocho was later appointed a local village leader by the local area chief Hence the settlement was named after his nickname - Korogocho. Mzee Korogocho is still alive and lives in Korogocho.

Korogocho is composed of a number of villages. These include: Nyayo, Korogocho, Highridge, Gitathura, Grogon, Ngomongo etc. (see map number 4). Gitathuru village is the oldest. It started as settlement for the most quarry workers.



MAP N° LI

KOROGOCHO VILLAGES

Government policy of demolishing slums in 1970s saw the expansion of Korogocho slum settlement. A series of slums were demolished and many of the inhabitants of korogocho resettled there from other slums demolished from other parts of Nairobi. There was a slum situated at Ruaraka called Babadogo. It was demolished in 1971 and those evicted resettled at Ngomongo village of Korogocho. Highridge near Aga Khan Hospital was demolished in 1977 and the victims re-settled in Korogocho at Highride village. Each household was given an individual plot.

In 1978, those evicted from Kirinyaga road slum were resettled at Korogocho village. Grogon slum settlement, near the country bus station was demolished in 1979 and those evicted were taken to the present Grogon village in Korogocho. In 1984, some squatters were removed from an individual private land near Karura forest. These were resettled next to Kisumu Ndogo which borders kariobangi sewage works. In a move to expand a few roads and pedestrian routes, in March 1987, the NCC demolished some dwellings and those affected re-settled at Nyayo Village. Gradually a slum settlement developed in Korogocho.

Observation

The well drained land in Nairobi is reserved for the rich people as settlement close to the town on the northern and western side of the town is occupied by middle income class. The eastern part of the city is occupied by relatively low income group. These settlements are congested hence most of the infrastructural services like solid waste disposal are lacking.

The high population growth rate and the high rate of immigration from the rural areas has created great demand for accommodation. This has led to the creation of shanty settlements. Such settlements include Mathare Valley and Korogocho which are located along river valley beyond zones recommended for settlements. The areas therefore has to contend with a number of problems such as lack of solid waste collection. Although Mathare Valley and Korogocho are located in the same zone with the city garbage dumping site at Dandora, the waste remains a serious problem there partly because of lack of access roads within the settlements. Lack of the access roads bars the trucks from collecting the waste. In middle and high class residential areas, the road system is well patterned to provide access to almost every residential unit. Nairobi therefore displays a dualistic planning approach.

3.4.0 Urbanisation and solid waste problem.

By 1920 about 19.4% of the World population resided in towns of 20,000 inhabitants and above. And by 1980 the world urban population was estimated to be 41% of the total world population. Projections shows that this figure will rise to about 51% by year 2000.

The current rates of Urbanization in African countries are among the highest in the World. Many Urban areas are increasing their population by 7 - 8 % per year, and in some cities, the annual increase is over 10% per annum, (Mwaura, 1991). This urbanisation process is expected to continue rising rapidly, thus worsening urban services provisions by the urban authorities. Urban services especially solid waste management are already recording deterioration trends.

However solid waste menace had not been a serious problem in urban settlement in Kenya until recently. Presently this is a serious problem and it has attracted a lot of media coverage. Excessive dumping of solid waste on open spaces, road reserves etc. has caused land pollution leading to a decline in environmental quality especially in slum settlement areas. As NCC is finding it more and more difficult to offer effective solid waste management, the obligation is falling on Nairobi's urban residents.

In 1980, Nairobi accounted for 50% of the total urban population in Kenya hence it has outgrown all other urban settlements in the Country, in population, physical development and spatial scale. This expansion of the city has however not proportionately matched by a similar expansion in solid waste, collection and disposal services and hence the serious problem of uncollected waste mostly in the low income residential settlements.

3.5.0 The beginning of solid waste management in Nairobi.

Early twentieth century, a plaque broke out in Nairobi and claimed the lives of about 50 people. Consequently, a private company was contracted to cleaning, sweeping, collecting garbage, cleaning drainage systems and lighting the city streets. This marked the beginning of solid waste management in Nairobi. However, the company failed in its duties (While, 1948). This led to laying out of rules in 1904 for the whole colony as far as sanitary matters were concerned. Another ordinance for Nairobi was formulated in 1905 and it was further enacted in 1906. While various ordinances contained many useful regulations, some were vague and also difficult to follow. Others were absolutely senseless.

In Kenya, the present waste management system borrows a lot

from the Public Health Act of 1875 in London. According to the Act, the refuse from premises are to be removed by the sanitary authority on appointed days. In 1920, the Public Health Ordinance became operational in Nairobi. This was the start of the modern waste management system. The ordinance obliged each occupier of a premise to place the refuse in a movable receptacle hence dustbins use recognised legally. The urban authority employed people for sweeping and cleaning the streets and the collection and disposal of refuse. Later the authority was empowered to make by-laws with regard to the above services.

However, institutional provisions for efficient waste management system had been inadequate and unresponsive to the changing circumstances due to unprecedented expansion of the urban population. By-laws setting standards and guidelines on environmental sanitation have either been lacking or where they exist they have been enacted at the level of government incapable of managing the environment (Mwaura, 1991)

Due to the deficiencies by local councils in waste management, in Kenya, the government set up an office of the Directorate of Civil Operations in 1986. It was charged with the responsibility of enhancing environmental sanitation in Nairobi city. The functions of this office has been expanded recently to include elements of development and land control.

3.6.0 Planning experience of Nairobi

It is only the economic forces without any co-ordination that controlled the growth on Nairobi town in its early days. The lay out of gridiron street pattern was only found at the centre. As a result a town planning consultant was appointed in 1926 and charged with the responsibility of making recommendations as far as zoning was concerned. This did not achieve much as the town continued growing in uncontrolled form as the land speculation went on. This failure resulted to commissioning of Master plan study in 1948 which introduced the principal's of neighbourhood units. Focusing for 20 years the Master Plan study earmarked land for activities such as industrial & residential.

However after independence the city experienced high rate of immigration creating pressures in housing, community services and physical infrastructure, (Nairobi City Council, 1993). A comprehensive urban study was commissioned in 1973 and charged with the responsibility of laying out the growth strategies of the city. It consisted of a series of policies related to the major aspects of urban development and the broad physical structure within which these policies could be realised. It was recommended that a continuous review of policies and structures should be maintained so as to make necessary adjustments to the changing circumstances. However nothing has been done yet hence the many deficiencies in the city.

CHAPTER FOUR

DATA ANALYSIS

4.0.0 Introduction

This chapter deals with data analysis and discussions in the light of the study objectives and assumptions. The data of each objective and the corresponding assumption is analyzed separately and summary is given after data analysis of every sub-section.

The disposal of solid waste in Nairobi is currently a dilemma which has already caught the attention of mass media, the city residents and non governmental organisations. The solid waste problem has also generated social and political action, aimed at alleviating it, (Undugu Society of Kenya, 1991).

Refuse collection by the Nairobi City Council (NCC) seem not to show signs of improvement despite efforts by the NCC and private sector to intensify its disposal. It is estimated by the NCC that annual refuse generation was approximately 339.5 thousand tonnes in 1992 out of which the NCC and private companies managed to dispose only 138 thousand tones, (Kenya Government, 1993).

Khandaka, (1988) says that the status of management of solid wastes in the city of Nairobi, as indicated by the presence of heaps of uncollected refuse shows that the waste problem in Nairobi is real.

To assess the ability of Nairobi City Council (NCC) to manage solid waste in Nairobi the examined aspects include the following; NCC's financial limitation, capacity and conditions of waste collecting trucks, manpower in the cleansing section of the Public Health Department, solid waste disposal trends, frequency of the waste collection by NCC, community feelings about the ability of NCC to handle the waste and so forth.

4.1.1 Deteriorating capacity of NCC to handle solid waste in Nairobi.

According to Development plan of 1994/96, the NCC collects only 1/4 of the solid waste generated in Nairobi. Most severely affected are those slums where uncollected waste is a major cause of the high rates of diseases, disabilities and deaths especially among children.

Solid waste disposal by NCC has been recording downward trends over years as illustrated by the data in the table below.

Table No. 1: Annual refuse collection capacity
by NCC (1974 - 1985 and 1992).

Year	Tones collected
1974	173783
1975	192092
1976	186524
1977	202229
1978	197619
1979	136906
1980	187595
1981	178834
1982	178136
1983	159974
1984	144650
1985	136805
-	-
-	-
1992	144000

Source: Cleansing Section, NCC.

The table above shows that more solid waste was disposed in 1970s as compared to 1980s and 1990s. For instance in 1992 NCC collected only 144,000 tones. This figure is below the amount disposed off annually in 1980s and 1970s in the most years.

As the waste disposed decreases year after year the city population records an increasing trend. According to the 1979 and 1989 population census, the population of Nairobi was 1,325,000 in 1989 as compared to only 830,000 in 1979.

This shows that though solid waste disposal services are deteriorating the city population is at an increase at the rate of 7.5% (Obudho 1992). As a result slum settlements in the city are expected to expand hence solid waste generation and accumulation is going to increase and NCC would find it even more difficult to manage it. According to the foregoing an urgent alternative approach to the solid waste management should be sought. Community participation is one of the alternatives.

4.1.2 Financial constraints facing NCC

The study established that the Cleansing section of the Public Health Department is faced by an acute problem of lack of adequate funds for solid waste disposal operations. For instance in 1988/89 financial year, the Cleansing section's budgeted expenditure in million Kshs. was 4.5 while the income was only 1.1 million Kshs. This means that there was a net of 3.4 million Kshs., hence the poor service provided. The conservancy charges which are expected to service solid waste are billed through the water bill. The current charges is

Ksh. 10 per dustbin per month. According to the NCC officials this amount is not enough for this service. This is mainly because some households, mostly in slum areas are not connected to the piped water hence they do not pay for this service. But the respondents in Mathare Valley and Korogocho claimed that they should not pay the conservancy charges because NCC does not provide the service in their areas.

Conservancy charges are supplemented by the property tax, license fees, service charge etc. Service Charge Act was created in 1988 and it requires every employer to deduct from every employee's salary, an amount ranging from Ksh. 10 to Ksh. 100 per month depending on an employee's salary. These deductions are supposed to be remitted to local authorities each month.

Financial limitations facing NCC was confirmed by the Minister for Local Authorities in 1993 during the City Convention. In his report he said that most of the local authorities in Kenya do not have sufficient funds to be able to discharge their duties. He also revealed that the major cause of the financial constraint facing the local authorities is mismanagement of resources. He said that the Nairobi City Council's revenue is half heartedly collected and even the little that is collected hardly reaches the council's Treasury, (Nairobi City Council, 1993). Lack of sufficient

funds has resulted to ineffective solid waste management in Nairobi hence the waste is thrown at every available open space as it is evidenced below.

Plate No. 1: Uncollected solid waste thrown on access road in Mathare Valley.



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An official from Cleansing section of the Department of Public Health in Nairobi City Council said that there is need to make the section a full department so that its budget may be increased. He argued that cleansing operations are very wide thus the need to make the section a department of its own.

4.1.3 Shortage of solid waste collection trucks and the waste collection workers

The study also found out that solid waste collection in Nairobi is adversely affected due to shortage of collecting equipment such as trucks. The study established that currently there are only 23 trucks which are in operation, out of which 14 belongs to NCC While the remaining 9 are owned by National Youth Service. According to the estimates by the Cleansing section 100 trucks are required to make solid waste disposal in Nairobi effective. The research established that most of the NCC trucks are out of operation due to mechanical breakdown. This is mainly due to lack of funds to purchase the spare parts. In addition, most of the trucks are too old such that maintaining them is quite expensive.

By 1991, there were 32 serviceable NCC vehicles on use. However those in actual use were about 27 due to mechanical breakdowns, (Mwaura, 1991). This shows that solid waste collection trucks have decreased tremendously from 1991 to

1995, indicating the urgency at which other actors should come in to supplement the waste disposal services provided by NCC.

The study also established that there is shortage of workers in the cleansing section. Out of the required 1000 workers the section had only 400 workers by the time of the study. At the same time there were 45 field supervisors while it was estimated that a total of 65 were required. Shortage of the working crew and the supervisors has therefore facilitated to the deterioration of solid waste collection in Nairobi.

4.1.4 Frequency of solid waste collection by NCC in the study areas.

Solid waste collection operations in Nairobi are divided into 5 zones, namely; Central, Northern, Southern, Western and Eastern. Mathare Valley and Korogocho falls under Northern zone. However, solid waste collection in both areas by NCC is very minimal and irregular as it is evidenced from the table below.

Table No. 2: The waste collection frequency by NCC in Mathare Valley and Korogocho.

Collection Frequency	Frequency	Percentage
Once in a week	0	0
Once in a fortnight	0	0
Once in a month	4	5.9
Once in 2 months	16	23.5
Once in more than 2 months	48	70.6
Total	68	100.00

Source: Field Survey 1994.

Most of the respondents (70.6%) said that NCC collects waste in Mathare and Korogocho areas once in more than 2 months. Even when this is done, the waste is collected only along the roads leaving most parts unserviced. Some respondents claimed that NCC waste collection trucks take as much as half an year without collecting the waste in those slum areas. Sometimes the waste piled up by the residents for the NCC to collect ends up rotting at the storage site as it is demonstrated below.

Plate No. 2: Chicken scattering solid waste piled by the community in Korogocho after NCC failed to collect it.



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Table: No. 3: Waste collection frequency by NCC in Nairobi by 1990.

Area	Collection Frequency
City Centre	About once per 1-2 days
High income areas	About once per 7-10 days
Low income areas	About once per 7-12 days
Underdeveloped areas	About once per 7-78 days

Source: Mwaura 1991

According to the 1974 **Special Technical Study: Solid Waste in Nairobi**, prepared by SWECO (Stockholm) for World Health organisation (WHO), by that time solid waste was collected at the city centre six times a week while in all other areas in Nairobi it was two times a week. This further demonstrates how solid waste management services by NCC has deteriorated as compared to the current collection frequency.

Table No. 4: Current frequency of solid waste collection in Nairobi.

Area	Frequency of collection
High income	Once per week
Middle income	Once per two week
Low income	Not regular

Source: Field Survey 1994.

The above data indicates that solid waste management service in Nairobi had been deteriorating, hence the need to integrate the community in this waste management system.

4.1.5 Vermin problem in Mathare Valley and Korogocho due to uncollected solid waste

Lack of effective solid waste management services especially in slum areas has resulted to various problems including the vermin menace as it is illustrated by the table below:

Table No. 5: Vermin menace in Mathare and Korogocho

Vermin Menace	Frequency	Percentage
Very high	63	92.6
High	4	5.9
Moderate	1	1.5
Low	0	0.0
Total	68	100.00

Source: Field survey 1994.

The above data indicates that vermin are very common in Mathare Valley and Korogocho areas because of the presence of uncollected solid waste. This is confirmed by the 92.6% of the respondents who said that the menace is very high. The only way of eliminating this problem is by making the environment clean but given the current financial constraints facing NCC to achieve a clean environment especially in slum areas through the effort of NCC may be just a dream.

4.1.6 Alternative actors in the waste management

Of all the respondents interviewed, only 3% claimed that NCC should continue providing solid waste management in Nairobi while 97% claimed that other alternatives should be resulted to rather than relying on the inadequate services provided by NCC.

Table No. 6: Suggestions of the actors to be involved in solid waste management.

Actor(s)	Frequency	Percentage
Private firms through contracts	6	8.8
CBOs and Private firms partnership	40	58.8
CBOs	15	22.1
CBOs and NGOs partnership	5	7.4
NCC	2	3.0
Total	68	100.00

Source: Field Survey 1994.

The suggestion of 58.8% of the respondents is that community based organisations with partnership with private firms can undertake the waste management service while 22.1% were of the opinion that this service should be undertaken by community based organisations.

4.1.7 Solid disposal sites by the households in the study areas.

In the absence of solid waste disposal services by NCC the Mathare Valley and Korogocho residents have resulted to the following disposal sites.

Table No 7: Waste disposal sites by the households.

Disposal site	Frequency	Percentage
Road Reserve	11	16.2
Other open space	44	64.7
Bulk container provided by NCC	0	0.0
River Bank	9	13.2
Burning	4	5.9
Total	68	100.00

Source: Field Survey 1994.

According to the findings, majority (64.7%) of the residents throw the waste at the limited open space while 16.2% throw their waste at the road reserve. As it is indicated in the table, none of the respondents throw waste in the metal bulk container. This is because these containers are not provided by the NCC. Since both Mathare and Korogocho are bordered by

a river, 13.2% dump their waste along the river bank. This not only blocks the flow of the river but also pollutes it.

Plate No. 3: Solid waste thrown at the river bank in Korogocho.



4.1.8 Summary

The data analysis indicates that solid waste management service by Nairobi City Council (NCC) has been declining since late 1970s despite the fact that the waste generation has been increasing as the population growth of the city expands. The areas severely affected are the slum settlements like Mathare Valley and Korogocho. Lack of access roads has been sited as one of the reason why NCC does not often collect the waste from these settlements.

But critically looked at, there are more genuine reasons as to why NCC does not often collect the waste piled by the residents either on the road reserve or any other accessible open space. Top on the list is the financial limitations by NCC which determines the availability of the waste collecting trucks among others.

According to the data therefore, NCC is unable to offer effective service in the solid waste management in Nairobi. This confirms the first assumption that solid waste menace will continue to pile up if other alternatives will not be sought.

4.2.0 Evaluation of community based solid waste management strategies among the urban poor in Nairobi.

4.2.1 Introduction

This sub-section is based on the second assumption: that success of the solid waste management in Nairobi will depend on the local community participation and adoption of appropriate technology. Therefore, the community based solid waste management activities in the study areas are evaluated after which the conclusion is drawn on whether these alternative solid waste management strategies can be effective or not.

Some of the Mathare Valley and Korogocho residents are actively involved in solid waste disposal in their residents. Their involvement is mainly in composting by small scale groups, and neighbourhood communal clean up activities. Over 15 small scale groups in Nairobi are making compost from market and household organic solid waste. Most of these groups have been trained and coordinated by NGOs such as Foundation for Sustainable Development in Africa (FSDA) Uvumbuzi Club and Undugu Society of Kenya.

Composting is geared towards resource recovery. Resource recovery and solid waste management activities should form a set of interdependent activities. Resource recovery system can be divided into two sub-systems: Firstly, we have the front-end system which deals mainly with the mechanical separation of materials without altering their physical properties. The purpose of a front end system is to separate solid wastes into homogeneous categories. The refuse can be separated at the source or at the collection point.

The second resource recovery sub-system is called Back-End system. This involves the use in some productive form of the larger portion of the fraction that is left after preliminary mechanical separation. Unless this sub-system burns the remaining refuse for its energy content, it is more difficult and expensive to recover value from this portion of the waste.

As the economics of waste disposal services changes, waste recycling and resource recovery are becoming increasingly cost-effective, (United Nations, 1993). Re-processing, recycling, and re-using concepts can all be categorised under resource recovery.

This involves the following:

- i. Receiving such articles as containers which are recovered in their original form either when emptied or by subsequent effort.

- ii. Recovering substances from refuse in a reasonably pure form suitable for use as the raw material for products similar to those discarded, such as metals and plastics.
- iii. Adapting waste products to different applications.
- iv. Altering large portions of the heterogeneous mass of waste in form and substance into new products such as composting.

Industries in Nairobi which buy recyclable include Madhupaper and Chandaria which deals with paper while EMCO industry deals with scrap metals. In addition, some Jua Kali artisans especially at Gikomba and Dandora buy some scrap metals and tins.

Due to the problems posed by the uncollected solid waste in these settlements the residents are organising themselves into small groups and engage in the waste management activities. These organisations are mainly initiated by environmental non governmental organisations mainly engaging in organic solid waste composting activities

The table below indicates the activities undertaken by the communities in managing the residential waste in Mathare Valley and Korogocho.

Table No. 8: Community participation methods in residential solid waste management

Participation methods	Frequency	Percentage
Composting	4	21.1
Collecting the waste and burning it or pilling it in an open place	11	57.8
Unblocking drains	4	21.1
Total	19	100.00

Source: Field Survey 1994.

4.2.2 Composting

The study found out that composting is already being done in Nairobi especially in low-income areas though on small scale basis. Most of these composting groups are dominated by women and majority of them were initiated by environmental non governmental organisations. For instance, in 1992, Uvumbuzi environmental lobby club in Nairobi started organic waste composting project. The objectives of the project included provision of solution to the solid waste disposal problem and generating income for the local residents.

Dandora residential estate was selected as the project site to provide a contrast to the poorly disposed waste in the nearby dumping site. Later the project activities were extended to Korogocho, a nearby slum settlement. Uvumbuzi established demonstration site which was used to offer training to various community groups. Also the club embarked on awareness campaigns for the general public through the use of posters, radio talks, news features and lectures.

Through the initiatives of the club, five community groups are currently involved in the production of garden compost from the residential organic solid waste. The members of these composting groups are involved in collecting and turning the piles weekly, sieving and packing in preparation for delivery.

However, marketing is still almost entirely dependent on the Uvumbuzi club. The compost market includes private gardens and landscaping companies. The groups have little access to the compost consumers as they lack skills in public relations and marketing. The table below shows that 25% of the respondents claimed that the waste generated in Mathare and Korogocho is composted by Community Based Organisations (CBOs). But still the problem exist as 44.2% claimed that the waste is not collected from where it is thrown by the households.

Plate No. 4: Composting activities being undertaken by one of the composting CBOs in the study areas.



4.2.3 Neighbourhood communal clean up activities

There is organised neighbourhood clean up activities in the study areas. In Korogocho this activity is undertaken by some households who have volunteered to clean their neighbourhood on weekly bases.

"In Korogocho it had been an accepted fact by the residents to live with mountains, of garbage. This caused concern to the residents because the waste posed a health hazard to the people. The residents organised themselves into small groups in 1993 according to the villages in korogocho and now they are able to engage in clean up activities on a weekly basis", (Daily nation, Saturday September 17, 1994).

Plate No. 5: Neighbourhood clean up activities in Nyayo village in Korogocho.



The overall project is called *Takataka Afya Korogocho* (TAK). The groups clean their neighbourhoods every Thursday. Besides collection of the wastes these groups are also embarking on construction of drainage canals and public toilets. These groups have been supported and motivated by various

organisations which include; African Network for Prevention and Protection Against Child Abuse and Neglect (ANPPCAN) and UNICEF. These organisations have helped these groups with cleaning tools such as wheel barrows, shovels, rakes, brooms etc.

The study found out that the CBOs dealing with waste management meet (work) on weekly basis for a varying duration as it is indicated by the table below.

Table No. 9: Working Duration By CBOs

Duration of participation	Frequency	Percentage
2 hours per week	0	0
3 hours per week	15	83.3
4 hours per week	1	5.6
5 hours per week	2	11.1
One full day	0	0.0
Total	18	100.00

Source: Field Survey 1994.

4.2.4 Community and NCC partnership in disposing solid waste

Mathare Youth and Sports Association (MYSA) is one of the groups which is collaborating with NCC in cleaning slum areas. MYSA's cleaning service programme started in 1988. This organisation is comprised of youth from slums and they undertake cleaning alongside their games activities especially football. The games activities acts as a motivating factor. MYSA came into being in 1987 after a group of youth and social workers in the local non governmental organisations such as Undugu Society of Kenya, the Christian Youth Adult Movement from St. Teresa Catholic and Muslim Youth Association for the youth dwellers in Mathare Valley. Solid waste menace was identified as one of the problems which needed serious attention hence the youth from Mathare Valley were organised into neighbourhood cleaning groups.

Currently MYSA members undertake cleaning activities every Saturday. They are organised into groups according to their ages. When some groups are cleaning others are busy playing football. Mathare Youth Sports Association has expanded from Mathare valley to cover many other slum settlements in the eastern parts of the city. These include Eastleigh, Huruma, Dandora, Kayole, Pumwani, Mathare North, Kariobangi and Kahawa. The youths clean their own residents. Due to their

clean up activities MYSA received "500 Global Award" from the UNEP in 1992. Some cleaning equipment were provided to them by Norwegian government and other well wishers.

MYSA members work in collaboration with NCC in sense that NCC provides some working equipments to them during their working activities. These equipment includes wheel barrows, jembes, spades and also waste collection trucks. So the waste collected by MYSA is taken to Dandora disposal site by the NCC trucks.

Plate No. 6: MYSA members cleaning Mathare valley in one of the organised clean up operations. The NCC truck shown is helping them to transport the collected waste to the Dandora disposal site.



Table No. 10: Opinions towards the communal clean up activities:

Opinion	Frequency	Percentage
Highly effective	11.0	16.2
Moderately effective	51.0	75.0
Not very effective	6.0	8.8
Not effective	0.0	0.0
Total	68.0	100.00

Source: Field Survey 1994.

According to the data in the table above, 75.0% of the respondents feel that the communal neighbourhood clean up activities are moderately effective while 16.2% feel that it is highly effective. This shows that this approach can be considered as one of the community participation strategy in managing the waste.

4.2.5 Alternative to the dustbin problem

The study found out that NCC does not provide dustbins to the households in Mathare Valley and Korogocho. NCC officials, claimed that the financial constraints facing NCC can not enable them to supply dustbins not only to slum settlement areas in Nairobi but also to other settlements.

The households, have consequently resulted to the following containers which serve as dustbins.

Table No. 11: Nature of solid waste storage containers in the study areas.

Nature of container	Frequency	Percentage
Plastic bucket	12	17.6
Paper or plastic bag	33	48.6
Cartons	15	22.1
Plastic cooking-oil tin	6	8.8
Dustbin provided by NCC	0	0.0
No waste container	2	2.9
Total	68	100.00

Source: Field Survey 1994.

The data above indicates that majority of the households (48.6%) use paper or plastic bags as waste storage containers. When these bags gets filled up they are thrown away together with the waste. Other containers used include; plastic buckets, cartons an plastic cooking oil tins. 2.9% of the residents have no waste storage containers. They throw the waste away immediately it is generated.

According to the table below, the waste is thrown away from the household in short duration. 44.1% disposes the waste after only two days. This is because the containers are so small.

Table No. 12: Waste Disposal Period

Waste disposal period from the household	Frequency	Percentage
Once in a day	19	27.9
Once in two days	30	44.1
Once in four days	9	13.2
Once in a week	8	11.8
Immediately	2	2.9
Once in more than a week	0	0.0
Total	68	100.00

Source: Field Survey 1994.

4.2.6 Scavenging

Currently in Nairobi scavenging operations are purely private and uncoordinated. The waste collectors normally concern themselves with the extraction of a single material which they sell mainly to wholesale dealers. They sell their recovered material at a low prices because they have no bargaining power, for they have no organisation or co-operative.

If scavenging work is not carefully done it may cause many hazards, for instance exposure to poisonous materials, dirty working conditions and injuries from metal and glass.

In Kenya, scavenging is not allowed in the legislations. All refuse for disposal is supposed to be placed in a receptacle for collection service, (The City of Nairobi (conservancy) By-laws 1961 (L.N 659/1961)). The By-Laws further states that any person who shall without lawful authority wilfully interfere with or empty out the contents of a receptacle shall be guilty of an offence against these By-Laws. This is prohibited mainly because of the tendency to scatter rubbish in the process and also because the practice is unhealthy. However, this prohibition is not seriously effected for scavenging activity is common in Central Business District (CBD), residential areas and also at the Dandora dump-site.

In some cities of other parts of the world this profession has been improved through improving working conditions of the waste collectors. For example, the University of Bandung helped local waste collectors to form association and gave advice and relevant support which in turn improved the working and living conditions of the waste collectors. The waste collectors established a co-operative which co-ordinates in collection sorting, composting and selling of the recyclable.

In the city of Juarez, Mexico waste collectors formed their co-operative called, "*The Co-operative Society of Material Recovers*". They work together at the landfill and the co-operative looks for the market of the recyclable and bargains for the prices. This has averted exploitation of the waste collectors by the middlemen. This has also not only ensured regular income but also education and medical services for both the workers and their families.

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In Mathare and Korogocho scavenging takes place in a limited scale. The waste collectors mainly collect paper, plastics, scrap metals and bottles. Paper is the dominant component collected by the waste collectors. The waste collectors sell their collections to the middlemen who in turn transport the items in bulk to the waste recycling industries which include Emco industry for scrap metal, chandaria and Madhupaper industries for paper. The waste collectors sell 1 kg. of

paper at Ksh. 1.40 while one piece of bottle or scrap metal are sold at Ksh.1.00 per piece (Mwaura 1991). The waste collectors interviewed confirmed this and claimed that they are exploited by the middlemen who sell the collected items to the industries as much as twice the price they buy from the waste collectors. Some of the waste collectors interviewed expressed the need to have their marketing cooperative so that they can be able to transport their collected items directly to the industries.

According to the data as indicated in table 13 below, 55.9% of the residential waste consist of paper, plastics and scrap metals, and bottles and tins. This is a fair percentage and this means that this recycling activity has some potential if it is properly organised. Paper alone accounts for 27.9%. Streamlining scavenging activities would result to more job creation among the urban poor apart from keeping the neighbourhood clean.

Table No. 13: Main components of residential solid waste

Component	Frequency	Percentage
Organic waste from food preparation	30	44.1
Paper	19	27.9
Plastics and scrap metals	11	16.1
Bottles and tins	8	11.9
Total	68	100.00

Source: Field Survey 1994.

The researcher established that the households in both Mathare Valley and Korogocho areas, do not separate their wastes into different components. Separating waste components at the household level would not only make scavenging activity efficient and health but also the households can earn some income.

4.2.7 Private solid waste collection

This refers to collection of waste materials from private properties and residential areas either by individuals or companies. The arrangement is usually done by the collecting firm and the owner or occupiers of the premises.

In Nairobi, private solid waste disposal at the individual level has been in operation for some time. It was however in 1988 that organized commercial garbage collection was initiated but it operated without official approval until March 1991, (Undugu Society of Kenya, 1991). According to this study, the private firms dispose 12.5% of all the garbage collected in Nairobi.

In Nairobi there are only two commercial private companies which engage in solid waste disposal. These are Domestic Refuse Disposal Ltd and Bins (Nairobi) Services Ltd. These two private companies services the high and medium income estates hence the low income areas are ignored.

Domestic Refuse Disposal Services (DRDS)

It started its operations in 1987 with 800 clients. Its services concentrated in high income residential areas (Westlands, Karen, Kyuna, Lavingtone and Parklands) and very

few factories. Clients are charged Ksh. 75 per month. However DRDS do not undertake any recycling activity for it dumps all the waste collected at the Dandora landfill. NCC charges it Ksh. 30 for every truck of waste dumped at the landfill. The organisation has only 4 trucks but fewer than these are in operation at one given time because of mechanical break-downs.

Bins (Nairobi) Services Ltd.

This started its operations in 1988. Currently it services about 3000 homes and 101 factories. It disposes about 10-12 tones of waste per day. The household clients are charged Ksh. 225 per month. These are from high income areas.

Bins Ltd owns 7 waste collection trucks of 3 tones each. Unlike DRDS, Bins Ltd is involved in some recycling aspects - the salvaging of plastics, metal, glass and paper. They do sorting in their yard and it is estimated that about a half tonne of recyclable materials is recovered from every 3 tones collected. The recyclable are sold to the recycling industries while the remaining waste is dumped in the Dandora dump-site.

Bins Ltd give their clients 2 waste bags and the collection frequency is once a week from each premise. 85.7% and 76.2%

of households in Plainsview and Dandora respectively expressed willingness to have private garbage disposal services introduced there, (Mwaura 1991). The ability to pay for this service depends on the incomes of the households. Mwaura (ibid) established that while 88.9% of the households in Plainsview were capable of paying for this service (Ksh. 140 per month), only 19% of the relatively poor Dandora households can afford. In Nairobi the few garbage collecting companies prefers to offer their service in relatively high income areas. This is because of the financial limitation among the low income households.

This study established that there is no private company which collects waste in Mathare Valley and Korogocho. An interview with the two private firms dealing with commercial waste collection in Nairobi confirmed that these companies prefer working in high and middle income areas. This is mainly because the households in those areas are capable of paying the charges. While 95.6% of the respondents saw the need of engaging private firms in the solid waste collection, only 1.5% expressed willingness to pay for the service. 98.5% argued that they are not capable of paying even Ksh.50 per month while 92.6% argued that they are willing to engage in solid waste management activities if the waste management system is made to earn regular income to them. This shows that the majority of the urban poor are willing to enter the

residential waste management system.

In some countries private waste collection is on the basis of "Contract". This involves engagement by cities and private companies under formal agreements which requires the companies to collect and haul waste from specific location. The contractors are in turn paid from general public revenues or service fees collected by the city authority.

Solid waste collection in Cairo, Egypt, is entirely in private hands and largely financed by the recovery of materials from waste products, (HABITAT, 1992). However, street sweeping is done by the municipal workers. Donkey carts are the major solid waste transport system.

An investigation of private sector provision of solid waste services in Buenos Aires, Sao Paulo, Caracas and Santiago, Latin American large cities, revealed that the private sector can operate more effectively than the public sector provided the requirements for contestable markets are met, that is, each private firm given specific areas to service on competitive contracting bases/bidding. Numerous studies in the region recommend that the local authorities ought to establish operational and environmental regulations and standards which will give guidance to private contractors as well as have ability and power to oversee these actions.

Nairobi City Council should borrow a leaf from these countries where private waste disposal has succeeded.

4.2.8 Summary

The study has identified various actors already involved in the solid waste management apart from the NCC. These include community based organisations (CBOs), profit-making private firms, waste collectors and non governmental organisations (NGOs). However their activities are not well coordinated.

The bulk of the solid waste management activities by the community are aimed at resource recovery. Thus apart from making the environment clean the community is motivated into joining the waste management activities by the economic gains. Composting of the organic residential solid waste is one of the strategies which the urban poor are embarking on so that they can earn some income from it.

However the data shows that even where there is community participation in the waste management, the waste menace is still not solved. This is because the involvement of the community has not been very significant. But to some extent the community involvement in the solid waste management has eased the waste menace. The community ought to be encouraged and sensitised to put more effort in the waste management.

With the expansion of the community involvement in the waste management through appropriate technology it is expected that the waste management through this approach will be significant to the extent that NCC can play the role of coordinating the activities of other actors. Not until the community is fully integrated into the solid waste management that the waste problems can be significantly reduced in Nairobi

4.3.0 Problems encountered by community based organisations in residential solid waste management.

4.3.1 Introduction

This sub-section is concerned with assessing the problems which cripple the effort of the community to achieve an effective waste management service. The assumption made is that these problems has to be solved or reduced so as to promote residential solid waste management through community participation strategy.

There are various problems which hinders effective residential solid waste disposal by the community in Mathare Valley and Korogocho and the whole of Nairobi in general. The most significant ones include, lack of community sensitization on the importance and strategies of solid waste management, limited market for the compost, unhealthy conditions associated with composting, inadequate equipment and lack of space for composting or dumping the waste material.

4.3.2 Lack of community sensitization on the importance and strategies of waste management

One of the problems which face community participation in solid waste management in the study areas is lack of awareness on why and how they should undertake the waste management. About 73.5% of the respondents in both Mathare Valley and Korogocho do not participate in any form of community solid waste disposal. Majority of them claimed that the waste management is the work of NCC and not the community. This attitude has tended to lower the number of people participating in the communal solid waste management.

This shows that there is a need for aggressive campaigns aimed at educating the community on community participation in the waste management issues. This can be done by using various fora such as mass media, seminars, chief's barazas, posters and organised community clean up operations. /

However in slum areas like mathare and Korogocho chief's barazas and organised clean up activities can be more effective than mass media as it is shown by the data below that, 61.8% are not accessible to any mass media.

Table No. 14: Accessibility to mass media.

Type of mass media	Frequency	Percentage
Radio only	21	30.9
Radio and television	1	1.5
Newspaper only	1	1.5
Newspaper and radio	2	2.9
Newspaper and television	1	1.5
Not accessible to any mass media	42	61.8
Total	68	100.00

Source: Field Survey 1994.

4.3.3 Financial limitations of the small scale composting groups.

The study found out that most community based composting groups are faced by an acute problem of finance, a factor which limits the expansion of composting operations. Due to shortage of funds most community based composting groups are unable to purchase adequate working tools like wheelbarrows spades, gumboots and gloves. Lack of protective facilities like gumboots and gloves makes the working conditions unhealthy. The field data established that many members of

these composting groups have already left the groups mainly because of the poor working conditions as far as composting is concerned. Thus there is need to overcome this problem if composting activity is to be effective.

4.3.4 Problems related to composting

The major problem the community based composting groups in Mathare and Korogocho are facing is that of inadequate market for their compost. The researcher learnt that limited market for the compost has prevented most of these groups to expand their operations. The author also established that some members have already left these composting groups because of very little and irregular incomes gained from composting activity. Sometimes a ready compost can even stay for three to four months without market. One of the reasons for this limited market is lack of awareness to the general public of the existence of this compost hence there is a need to have an elaborate strategy of marketing the compost. The interviews with some of the compost making groups revealed that the members are not aggressive in finding the market for the compost. In most cases they rely on non governmental organisations like Uvumbuzi and Foundation for Sustainable Development in Africa as far as marketing is concerned. This indicates that the community based composting groups not only require composting making lessons but also marketing lessons.

Compost market is also limited by the fact that in most cases its contents are not tested in a laboratory. Thus potential buyers are reluctant to buy it. This shows that there is need to have frequent testing of the compost in laboratories. The other problem experienced by the composting groups is lack of adequate working equipments such as rakes, wheelbarrows, spades etc. This problem is compounded by lack of protective facilities such as gloves and gumboots.

Plate No. 7: Members of one of the composting groups in Korogocho arranging organic waste for composting. From the plate it can be seen that none of them has any gloves.



4.3.5 Problem of shelter at the composting site.

Lack of protective facilities makes their working conditions very unhealthy. Most of the composting groups have not been able to save enough money to construct shelter in their composting site. The plate above shows that this group has no shelter. The poles had been erected for more than six months at the time of this study but up to now the roof has not been made. When composting site is not sheltered, the composting activity is affected by whether, for example during rainy season, composting can not be effective because the compost collects water more than it is required. This does not only delay the compost making process but also it lowers the quality of the compost.

In addition, composting efficiency is affected by the fact that there is no separation of the organic waste by-types at the household level. The members of the composting groups collect the organic waste for composting from the neighbourhood where it is thrown by the households.

Collecting the organic waste when it is already mixed with other types of waste leads to waste of time as compared to when separation is done at the household level. Also it is more hygienic when the waste is separated at the source rather than when it is scattered at dump site. Therefore, there is

need to educate the community the importance of separating their waste at the household level.

3.3.6 Limited economic returns through the waste management practices by the community.

Another reason advanced by those who do not participate in the communal waste management is that of limited economic gains from the waste management activities. They claimed that they can only join the community based solid waste management groups if the waste management work can sustain them financially. Some argued that the already established composting groups can not guarantee them basic needs hence they prefer doing something else for their livelihood.

According to the foregoing, linking solid waste management system to income generation can be a positive gesture to ensuring an effective waste management and improving the welfare of the urban poor. This is very vital as poverty is real in the slum settlements in Nairobi. The level of poverty in Mathare Valley and Korogocho is illustrated by the data shown in the tables 15 to 20 below.

Table No. 15: Nature of houses in the study areas

Nature of house	Frequency	Percentage
Temporary	45	66.2
Semi-permanent	16	23.5
Permanent	7	10.3
Total	68	100.00

Source: Field Survey 1994.

Due to poverty in the study areas 66.2% live in temporary houses. These temporal houses mainly consist of wattle, mud, cartons or polythene papers. These pose not only health hazards but also fire risks to the residents. Only 23.5% live in semi-permanent houses while 10.3% live in permanent houses. Housing, therefore, is a great problem facing these urban poor caused by congestion and overcrowding, (Wangarup, 1988).

Table No. 16: Household size in Mathare and Korogocho

Household size	Frequency	Percentage
One	2	2.9
Two	10	14.7
Three	15	22.1
Four	12	17.6
Five	19	28.0
Six	2	2.9
Seven	1	1.5
Eight	7	10.3
Total	68	100.00

Source: Field Survey 1994.

Table No. 17: Number of rooms per household in Mathare and Korogocho

Number of rooms per household	Frequency	Percentage
One	56	82.4
Two	9	13.2
Three	2	2.9
Four	1	1.5
Total	68	100.00

Source: Field Survey 1994.

According to the field survey data, the average household size in Mathare and Korogocho is 4 people. This leads to congestion as indicated by the data above that 82.4% of the households in the study areas have only one room. Consequently the problem of lack of waste storage space was expressed by majority of the respondents.

Congestion in Mathare Valley and Korogocho has made sanitation a major problem. Open defecation and inappropriate systems are very common. Those who have no toilets use papers in their rooms and then through it to the refuse in the neighbourhood. In Mathare Valley few communal sanitation

Blocks are provided by NCC. These are poorly maintained. The fact that the residential refuse in the study areas are contaminated with human waste poses healthy danger to the people engaged in managing the waste. This health risk has kept off many people from getting involved in the waste management.

Table No. 18: Household income in the study areas

Household Monthly income in Ksh.	Frequency	Percentage(%)
500 - 1000	1	1.5
1001 - 2000	25	36.8
2001 - 3000	21	30.9
3001 - 4000	14	20.6
4001 - 5000	7	10.3
Total	68	100.00

Source: Field Survey 1994.

The data on the household income above shows that majority of the households (36.8%) earn a monthly income of between Ksh. 1001 to Ksh. 2000 and about 69% earns an income which does not exceed Kshs. 3000. This is below the estimated median household income of Ksh. 3000 per month in 1991 for Nairobi in general, (World Bank 1991). This is a meagre income

considering that the average household income is 4 persons. Majority of the residents are not employed. The data in the table below shows that 76.5% of the households earn their income from informal employment, mainly hawking as compared to 2.9% who earn their income through formal employment.

Table No. 19: Source of household income in Mathare and Korogocho.

Source of income	Frequency	Percentage
Informal Employment	52	76.5
Formal employment	2	2.9
Formal plus informal employment	14	20.6
Total	68	100.00

Source: Field Survey 1994.

The small percentage of those in formal employment is explained by the fact that 32.4 % of the people in the study areas have had no formal education while 41.2% schooled up to the primary level. Only 20.6% and 5.9% who have secondary and adult education respectively. This is shown by the data below.

Table No. 20: Education level in Mathare and Korogocho.

Level of education	Frequency	Percentage
Primary	28	41.2
Secondary	14	20.6
No formal education	22	32.4
Adult education	4	5.9
Total	68	100.00

Source: Field Survey 1994.

4.3.7 Summary

The data analysis has confirmed the assumption that residential solid waste management through community involvement is encountering some problems. These include lack of adequate community sensitization, the general negative attitude of many people towards the waste handling and meagre economic returns from the waste management activities to name but just a few. These problems should be alleviated so that the waste management by the community can be made effective.

Among them are general
from the waste management activities due to limited market of
the compost, unhealthy working conditions and lack of adequate
space for composting activities.

Thus there is need for Nairobi City Council (NCC) and relevant
management and the importance of the community adopting the
waste management "culture". Market for the compost and other
participation in solid waste management is to be sustainable,
comprehensive waste management regulations which explicitly

5.1.0 Recommendations

This study recommends solid waste management systems which

... of ... it leads to reduced costs of ...

effectively by involving and assisting small ...
... through ...
... the urban community need to be sensitised on the new dimension of solid waste management ... recycling groups ...
... structured through itinerant waste buyers, waste pickers, second-hand markets, dealers and a range of recycling industries, (Diana,1992).

5.1.1 Composting

The composting process involves the decomposition of organic matter into a stable, nutrient-rich soil amendment. This process is carried out under controlled conditions, typically in a compost pile or bin. The material is broken down by microorganisms, and the resulting compost is used to improve soil fertility and structure. The process is a natural one, but it is accelerated and controlled to produce a high-quality product. The composting process is a key component of sustainable waste management and soil health. It is a low-cost, low-tech process that can be implemented at a small scale, such as in a home garden or community composting program. The composting process is a natural one, but it is accelerated and controlled to produce a high-quality product. The composting process is a key component of sustainable waste management and soil health. It is a low-cost, low-tech process that can be implemented at a small scale, such as in a home garden or community composting program.

Small scale community based composting is a sustainable waste management practice that is generally accessible to all (Lynch, 1992). It provides an alternative to the unaffordable and often environmentally harmful practices of open dumping and incineration. Community based composting programs have been successful in many parts of the world, particularly in developing countries. These programs provide a means of generating income for participants, while also improving soil fertility and reducing the amount of waste sent to landfills. The composting process is a natural one, but it is accelerated and controlled to produce a high-quality product. The composting process is a key component of sustainable waste management and soil health. It is a low-cost, low-tech process that can be implemented at a small scale, such as in a home garden or community composting program.

... (faded text) ...
... (faded text) ...

5.1.3 Overcoming financial limitations of the composting groups.

... (faded text) ...
enable them to erect shelter, purchase composting tools and
... (faded text) ...
... (faded text) ... encouraged by NCC and NGOs to seek
... (faded text) ...
recommended that instead of rushing to share the meagre income
from the compost they should use the fund to purchase the
... (faded text) ... construct shelters at the composting
... (faded text) ...
... (faded text) ...
... (faded text) ... giving financial and material

5.1.4 Strengthening neighbourhoods cleaning operations.

The NCC (Neighbourhoods Cleaning Committee) is a community-based organisation that has been established in the slum areas. It is a voluntary organisation that has been formed by the slum residents. The NCC is responsible for the cleaning operations in the slum areas. It is through such local organisations that most of the slum settlements started off with their own cleaning operations. The success of these operations demonstrates the ability of the slum residents to organise themselves. It is through such local organisations that the slum residents can be sensitised on the importance of maintaining a clean and healthy environment. The NCC is also responsible for the collection of waste from the slum areas and its disposal at the landfill in Dandora.

To solve the problem of lack of waste dumping space the NCC has been working with the local authorities to identify suitable areas for waste dumping. However, the local authorities have been unable to provide the necessary space. The NCC has therefore been forced to dump waste in open spaces. This has led to the spread of waste in the surrounding areas. The NCC must work hand in hand with the local authorities to ensure that waste is collected and disposed of properly. The NCC must also work with the local authorities to ensure that waste is transported to the landfill in Dandora.

5.1.5 The role of private waste disposal companies.

The Municipal Council should ensure that private waste disposal companies are properly regulated and supervised. The Council should ensure that the companies are properly licensed and that they are held accountable for their performance. The Council should also ensure that the companies are held accountable for their performance through their neighbourhood committees should participate in monitoring the performance of the companies. The Council should involve the private companies, the Municipal Council and the Nairobi City Council as the co-ordinator or overall supervisor of the project. The Council should ensure that the companies are held accountable for their performance through their neighbourhood committees. The council should ensure that the private collectors honour their contractual obligations to the residents with the option of withdrawing the contract in the event of overriding complaints from the residents. The Council should also ensure that the companies are held accountable for their performance through their neighbourhood committees.

Some of the workers in the Cleansing section in the NCC can be employed by the contractors and others absorbed in other

Optional private collection should not be allowed because some areas may receive inadequate service (as some areas may not be very profitable for the contractors to work in) and

It is a responsibility of establishing operational and

composting projects should be...
The components of solid waste can be...

5.1.6 Recommendations on scavenging/waste collection.

employment in informal sector is already emphasised in the
conditions.

There is need to improve the working conditions of
attention is given by NCC, NGOs and relevant priv

...the role of NGOs in the waste management sector. The study found that NGOs play a significant role in supporting the waste collectors and improving their working conditions. The study also found that NGOs are involved in the collection and recycling of waste in the informal sector. The study concludes that NGOs are an important part of the waste management system and should be supported by the government and other stakeholders.

The waste collectors face a lot of harassment by the informal sector. The study found that the waste collectors are often harassed by the informal sector, which leads to a decrease in their income and a decrease in their working conditions. The study also found that the waste collectors are often harassed by the informal sector, which leads to a decrease in their income and a decrease in their working conditions. The study concludes that the harassment of the waste collectors by the informal sector is a major problem that needs to be addressed by the government and other stakeholders.

5.1.7 The role of NGOs /

The study found that NGOs play a significant role in supporting the waste collectors and improving their working conditions. The study also found that NGOs are involved in the collection and recycling of waste in the informal sector. The study concludes that NGOs are an important part of the waste management system and should be supported by the government and other stakeholders.

... stage makes the recovered fractions more polluted and
... sites creates serious health hazards to the waste collectors
...

The ...
...
...
... containers are recommended as opposed to the metal dustbins
... should be of different colours. On ...
Three waste bins are recommended for each household:

... solid waste, another for the plastic material
... scraps can be sold to the waste collectors or to the recycling
... community based organisations. Thus the household ought

management through source separation

... the ... of ...
... the ... of ...

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crisp metals

... the ... of ...
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management system should address the needs of
the community. The system should be designed to
provide a high level of service to the community
and to be cost-effective. The system should be
flexible and able to adapt to changing
circumstances. The system should be able to
provide a high level of service to the community
and to be cost-effective. The system should be
flexible and able to adapt to changing
circumstances.

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2

Areas for Further Research

- 1) Research on how to expand the market for the recycled products.

The first area for research is to determine the current market for recycled products. This can be done by conducting a survey of manufacturers and consumers. The survey should ask about the types of products they use, the quantity they use, and the source of the materials. This information will help to identify the current market and the potential for expansion.

The second area for research is to determine the barriers to the use of recycled products. These barriers can be technical, economic, or social. Technical barriers include the quality of the recycled materials and the availability of the products. Economic barriers include the cost of the recycled materials and the cost of the products. Social barriers include the lack of awareness of the benefits of recycled products and the lack of demand for them.

The research should also be geared towards identifying the most promising areas for expansion. This can be done by comparing the current market for recycled products with the current market for virgin materials. The areas with the largest potential for expansion are those where the recycled products are of similar quality to the virgin materials and where the demand for the products is high.

2. Legal framework on municipal waste management by various actors.

... other ...

... Currently also ... instruments specifying the importance of ...

3. How and where to dispose industrial and other hazardous waste.

The first step in the disposal of hazardous waste is to identify the waste and its characteristics. This is done by conducting a waste audit and testing the waste for its hazardous properties. Once the waste has been identified, the next step is to determine the appropriate disposal method. This is based on the waste's characteristics and the local regulations. The disposal method may include incineration, land treatment, or deep well injection.

Once the disposal method has been determined, the next step is to select a disposal site. This site must be approved by the relevant authorities and must meet all the requirements for hazardous waste disposal. The site must be able to handle the waste safely and must not pose a risk to the environment or public health. The disposal site must also be monitored regularly to ensure that the waste is being disposed of properly.

contaminated with the hazardous waste hence the importance of

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OPERATIONAL DEFINITIONS

COMPOSTING

The process of decomposing organic waste after which it yields a nuisance-free product suitable for use as a soil amendment.

COMMUNITY PARTICIPATION

In this study, community participation is defined as involvement of community members in the planning, implementation, and evaluation of waste management programs. It includes the participation of community members in the development of waste management plans, the implementation of these plans, and the evaluation of the results of these plans.

DISPOSAL

The process of getting rid of waste, usually by burying it in a landfill or by incineration.

DUMP

A land site where waste is deposited and left to rot in an uncontrolled manner.

POLLUTION

The presence of contaminants in the environment that are harmful to human health or the environment. In this study, pollution is defined as the presence of waste in the environment that is harmful to human health or the environment.

RECYCLING

The process of converting waste materials into new products. In this study, recycling is defined as the process of converting waste materials into new products that are used in place of the original materials.

REFUSE

Waste that is not accepted for recycling or energy recovery.

RESOURCE RECOVERY

The process of recovering resources from waste. In this study, resource recovery is defined as the process of recovering resources from waste that are used in place of the original resources.

SANITARY LANDFILLING

The sanitary landfilling process involves the controlled disposal of solid waste in a deep layer of soil. The waste is compacted and covered with a layer of soil to prevent the escape of odors and leachate. This process is the most common method for the disposal of solid waste in urban areas. It is a simple and cost-effective method, but it can cause environmental problems if not managed properly. The main items which are collected are papers, plastic, glass, metal, and other solid waste.

SCAVENGING

Scavenging is the process of collecting and sorting through solid waste to find valuable items. It is a common practice in many developing countries, where it provides a source of income for the poor. The main items which are collected are papers, plastic, glass, metal, and other solid waste.

SOLID WASTE

Solid waste is any material that is discarded or thrown away. It can be organic or inorganic, and it can be hazardous or non-hazardous. Solid waste management is the process of collecting, transporting, and disposing of solid waste in a safe and sanitary manner.

SOLID WASTE MANAGEMENT

Solid waste management is the process of collecting, transporting, and disposing of solid waste in a safe and sanitary manner. It involves a variety of activities, including source reduction, recycling, and landfilling. The goal of solid waste management is to minimize the amount of waste that is sent to landfills and to ensure that the waste is disposed of in a way that does not harm the environment or public health.

WASTE COLLECTORS

Waste collectors are individuals or organizations that are responsible for collecting and transporting solid waste from households and businesses to a central collection point. They play a crucial role in the solid waste management process, as they are the first point of contact for the waste. Waste collectors are often paid by the municipality or a private waste management company.

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Appendix

HOUSEHOLD QUESTIONNAIRE

Questionnaire No.

Name of the household head
Date of the interview
Time of day when interview was conducted

Household Information

Name of the respondent

Relationship to household head

- i. Male
- ii. Female
- iii. Unknown

Age of the respondent (in years)

Education level of the respondent

- i. No schooling
- ii. Primary
- iii. Post secondary
- iv. Graduate
- v. Post graduate
- vi. Professional
- vii. Other

Occupation of the respondent

- i. Unemployed
- ii. Self-employed
- iii. Employee

Estimate the monthly income of

- i. Less than 1000
- ii. 1001--2000
- iii. 2001--3000

- 10. (a) (i) Plastic
- (ii) Paper
- (iii) Glass
- (iv) Metal
- (v) Other
- (b) (i) Yes
- (ii) No
- (c) (i) Yes
- (ii) No
- (d) (i) Yes
- (ii) No
- (e) (i) Yes
- (ii) No
- (f) (i) Yes
- (ii) No
- (g) (i) Yes
- (ii) No
- (h) (i) Yes
- (ii) No
- (i) (i) Yes
- (ii) No
- (j) (i) Yes
- (ii) No
- (k) (i) Yes
- (ii) No

Waste Menace Data

10. List the main types of the solid waste produced in your household
11. Do you separate the waste by type?
- i. Yes (if yes, which ones?)
 - ii. No
12. Are there bulk containers provided by NCC in your area?
- a. i. Yes
 - ii. No
 - b. If no where do you dispose the household refuse?
 - i. Throw it on the open space
 - ii. Throw it on road reserve

- iii. Dump it in the common waste bin provided by NCC
 - iv. Burn it
 - v. Others (specify)
11. What items would you store if they are paid for?
12. What is the waste collection frequency?
- i. Once in a week
 - ii. Once in a fortnight
 - iii. Once in a month
 - iv. Once in two months
 - v. Once in more than two months
13. What is the nature of the household waste container used in your house?
- i. Plastic bucket
 - ii. Paper or Plastic bag
 - iii. Others
 - iv. Plastic cooking oil tin
 - v. Dustbin provided by NCC
 - vi. Others (specify)
16. Who provides the waste container?
- i. NCC
 - ii. self
 - iii. NGOs (specify)
 - iv. Others (specify)
17. How often do you dispose household waste from your house?
- i. Once in a day
 - ii. Once in two days
 - iii. Once in three days
 - iv. Once in a week
 - v. Immediately
 - vi. Once in more than a week
18. How is the vermin problem in your area due to the residential solid waste?

- i. Very low
 ii. High
 iii. Moderate
 iv. Low
18. Do you participate in communal residential solid waste management?
- i. Yes
 ii. No
19. If yes, how did you get the idea of joining the management group?
- c. If yes how do you participate?
- i. Composting
 ii. Collecting the waste and burning it or piling it in an open place.
 iii. Unblocking drains
20. For how long do you participate in the communal residential solid waste disposal activity?
- i. Two hours per week
 ii. Three hours per week
 iii. Four hours per week
 iv. Five hours per week
 v. One full day
21. Which mass media are you accessible to?
- i. Radio only
 ii. Radio and television
 iii. Television only
 iv. Newspaper only
 v. Newspapers and radio
 vii. Newspapers, radio and television
22. Enumerate all the problems you face while participating in managing the residential solid waste:
23. Suggest solutions to these problems
24. Name all community based organisations and governmental organisations which are involved in the

6. What is your opinion regarding the community participation in residential solid waste operations?
- i. highly effective
 - ii. moderately effective
 - iii. not very effective
 - iv. Not effective
7. Suggest the actor(s) who need to be involved in the residential solid waste management:
- i. Private firms through contracts
 - ii. CBOs
 - iii. CBOs and private firms partnership
 - iv. CBOs plus NGOs partnership
 - v. NCC
8. State the benefits of the community participation in the residential solid waste management.
9. If the management of the solid waste in your resident is made to generate some income, would you be willing to participate in this activity or would you recommend private profit-making firms to undertake this activity? Explain
10. Give suggestions on how solid waste in Nairobi can be managed effectively.

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