

TITLE

**THE IMPACT OF SOLID WASTE CHALLENGES ON URBAN  
MANAGEMENT ; –  
*THE CASE OF GARISSA MUNICIPALITY IN NORTH- EASTERN  
KENYA***

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Of

The Requirements for the Award

of the

Degree of Master of Urban Management  
by

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**(W50/P/7725/04)**

**JULY, 2011**



**DECLARATION PAGE**

I hereby declare that this Thesis is my original work and has not been previously presented for a Degree Award in any other University.

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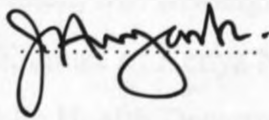
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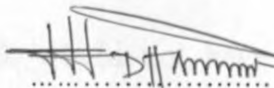


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*M. Kiragu.*

*JULY 2011*

DEDICATION PAGE

*To*

*My Parents,*

*Nyawira & Kiragu*

## ABSTRACT

This study is a discussion of robust and focussed long term strategic planning as method of overcoming serious solid waste disposal in problems in Garissa Municipality.

The Primary Research was conducted in Garissa town with research data being gathered by way of questionnaires and face to face interviews. Additional Research involved the sourcing of information through Libraries, Government and other offices and finally via the internet.

The study found out that the Council had failed to discharge its role as the major institution responsible for Solid Waste Management. The data and information gathered confirmed that there was a serious refuse management gap in Garissa that needed bridging, and further diagnose that the root cause of the problems bedevilling the solid waste sector in Garissa is acute lack of strategic planning, and this was identified in literature review and field interviews.

More broadly this study also found that today's approaches to solid waste management generally, were neither effective nor sustainable, and that current ubiquitous legislation, regulatory and enforcement mechanisms are wanting.

This study therefore recommends the creation of coordinated forward-looking management structures to infuse into all facets of solid waste management in Garissa, including waste handling strategies, citizens' education and Re-organization of Garissa Municipal Council.

The study also finds the emergence of a private sector in Garissa can be a welcome relief to the Solid Waste pressure, and advocates entry of a regulated vibrant Private sector and community participation into the Solid Waste industry in Garissa Municipality as a pragmatic move to improve service delivery. Ultimately, the study advocates a more concerted action by the Garissa Municipal Council, Municipal Residents, the Private

Sector , Governments departments, and indeed all Actors in the Solid Waste Field and argues that the real culprit is lack of forward and backward looking strategies.

It is anticipated this discourse will further contribute to the body of knowledge of Local Authority Planning in Garissa and ensure that the needs of the present generation are met without jeopardizing those of the future generations.

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## **ABBREVIATIONS & ACRONYMS**

GMC	Garissa Municipal Council
GCBD	Garissa Central Business District
LDCs	Least Developed Countries
HDCs	Highly Developed Countries
DCs	Developing Countries
SW	Solid Waste
SWM	Solid Waste Management
SWOs	Solid Waste Operators
NCC	Nairobi City Council
NEMA	National Environment Management Authority
UNICEF	United Nations Children's Fund
ALRMP	Arid Lands Resource Management Project
GTZ	German Technical Co-operation Agency
DANIDA	Danish Development Agency
<i>Adhuhur</i>	In Islamic Religious Practice, Afternoon Prayers
AMREF	African Medical Research Foundation
EPA	Environmental Protection Agency
CBS	Central Bureau of Statistics (Kenya Government)
GOK	Government of Kenya
Govt	Government of Kenya
NEP	North Eastern Province
PCSWGR	Per Capita Solid Waste Generation Rate
CP	Community Participation
CBO	Community Based Organization
<i>Lagga</i>	Natural Storm Waterway

## 1.0 CHAPTER ONE: - INTRODUCTION

### **1-1 BACKGROUND TO THE PROBLEM**

The problem that is solid waste management is probably as old as man's earliest civilisations. As Khadaka (1988) observes, the problem is traced back to the time when humans first began to congregate into tribes, villages and communities. More systematic ways of disposal were in demand as the amount of waste generated progressively increased in tandem with the income of the number of people living together on limited swathes of land (Muthoni, 1999).

According to Njau (2004), only 25 to 55% of all wastes generated in large cities is collected by municipal authorities . More than 5 million people die each year from diseases related to inadequate Solid Waste disposal practices (Njau 2004). 60% countries reported in prior submissions at the 1992 Earth summit that SWM disposal was among their biggest environment concerns. (UNCHS Habitat, 1994).

According to UNCHS Habitat (2001), the most rapid urban population growth in the last 10 to 20 years has happened in Africa. Here cities especially in the Least Developed Countries (LDCs), have changed in size, spatial organisation, quality and distribution of public services and infrastructure.

Mbui (1995) avers that with these rapidly growing metropolitan areas in the Developing Countries (DCs), there is a concomitant rise in a variety of by-products of urban life. Khadaka (1998) further singles out the disposal of some of these by-products for example solid waste as one of the principal limits to sustainability of towns and cities. Closer home, Kenya ranks among the developing countries and is also experiencing a high rate of urban growth particularly in medium-size towns. According to Otieno, 2003, stagnation of national

economies in DCs such as Kenya has inexorably led to inadequate provision of necessary infrastructure facilities.

A study by KUESP (1997) observes that the situation is worsened by many informal settlements that now exist within urban areas that arise from unfavourable economic conditions underinvestment in urban infrastructure, high natural growth rates and rural-urban migration. The results are the prominent blight afflicting most urban environments involving strewn litter, rotting garbage mounds and uncontrolled sprawl of dumpsites.

Even though solid waste has costs in terms of human and financial resources, poor handling adds further health & environment costs as well, as Ochieng' (2004) notes. Unplanned solid waste disposal results in long-term damage to amenity. Mbui (1995) condemns such piles of refuse as forming breeding grounds for rodents, flies and other types of vermin. KUESP (1997) notes that the diseases and other unfavourable conditions that are associated with (unhealthy) household environments occur mainly in LDCs where they account for nearly 30% of the total burden of diseases.

Kipkurui (1997) notes that environment problems have a cumulative impact that results in considerably higher and higher expenses if remedial action is attempted at later stages of a country's development. Countries such as Highly Developed Countries(HDCs), are still mopping up the negative aspects of development, hundred of years after the industrial revolution.

Additionally, for such countries, a further major hurdle with adverse complementarities is the reality of an all pervading presence of government and bureaucracy in Solid Waste Sector. As Walt (1994) points out, the reality is that in most countries, government remains the sole direct



actor in society's development. Ochieng' (2004) adds that SWM remains one of the major responsibilities of local governments the world over. He notes it as complex, and depending on the organization and co-operation between households; private enterprises and municipal authorities. Rondinelli (1990) notes that incentives, however, rarely exist for governments departments to perceive citizens as "clientele", and hence the extent to which their policies respond to the needs and priorities of the population is perpetually wanting.

### **1-2 STATEMENT OF THE PROBLEM**

The evolution of human settlement into urbanized entities has all along been geared towards a more orderly, efficient, healthier and gainful life. However these aspirations have often been imperilled by the loss of efficient control of waste products, prime amongst them ranks solid waste.

**Plate 1 –1; Goats Scavenging In An Unofficial Dumpsite At A Lagga In Bulla Sheikh (Next to the Kenya National Library Garissa)**



*Source: Author, Field Survey, 2009*

In DC's and LDC's local governments are seen to have failed to keep pace with rapid, unregulated urban growth, with the most visible evidence being the lapse in collection and disposal of solid waste (CMA 1992). Such governments have failed to promote good practice in occupational health, safety standards among the urban dwellers and ultimately population control. UNCHS Habitat (1994) thus concludes that the current approaches to SWM are neither affective, nor sustainable. Performance of SW infrastructure system in the third world continue to record poor performance (Esho, 1997) both in quality and quantity standards.

As will be seen in chapter two, efficient and safe SWM is a function of cleanliness in habitable environments and hence of Public Health and Environmental Protection. The 2002 Millennium Earth Summit agreed on specific development goals to be attained by all world governments by the year 2015 AD – prominent amongst them universal health and the well-being of the environment (Wikipedia; 2009) .

This thesis investigates such a critical gap in the phenomenon of strategic planning for SWM in Garissa Municipality, whose initial sign is evidenced in the sordid state of affairs in the Solid Waste Sector in Garissa Municipality. *Garissa* town is a town choking in Solid Waste (Plate 1 – 1). The residents are forever engaged in indiscriminate dumping leading to having blocked drainages, and roads & institutions almost being buried under garbage heaps, and *laggas* (natural storm waterways) being converted to unofficial dumpsites. Plastic bags and containers are strewn everywhere on the streets and polythene paper-bags blown to tree tops by the gale-force winds.

There is thus an apparent need to re-examine the SWM existing policies and institutional arrangements in Garissa Municipality, and recommend on optimum level of organization to better address the SWM question.

### **1-3 RESEARCH OBJECTIVES**

This research was conducted in line with the following objectives:-

#### **1-3.1 Main objectives**

To investigate the Challenges limiting sustainable domestic Solid Waste Management In The Residential Areas Of Garissa Municipality.

#### **1-3.2 Specific objectives**

*1-3.2.1: To establish the current role of GMC in Provision of SWM Services*

*1-3.2.2: To examine the institutional, capacitive & operational weaknesses of GMC in SWM.*

*1-3.2.3: To propose a shift in policies and strategies for SWM in Garissa Municipality*

### **1 – 4; RESEARCH QUESTIONS**

**1-4 .1 :** What are the Challenges limiting sustainable domestic Solid Waste Management In The Residential Areas Of Garissa Municipality.?

**1-4 .2 :** What is the current role of GMC in Provision of SWM Services ?

**1-4 .3 :** What are the institutional, capacitive & operational weaknesses of GMC in Provision of SWM Services.?

**1-4.4 :** What re-alignments in policies and strategies for SWM in Garissa Municipality can best re-dress the said poor SWM regime in GMC ?

### **1– 5; ASSUMPTIONS OF THE STUDY**

1-5.1 There exists an insufficient policy of SWM in Garissa and this situation is bound to persist.

1-5.2 Residents will continue to flock and dwell in Garissa due to unique parameters including the instability in Somalia country, irrespective of the level of unpleasantness engendered by the SW question.

1-5.3 There exists a massive potential for robust Solid Waste Management once proper principles are installed into place.

## 1 - 6 ; STUDY AREA AND SCOPE

The study centered on Garissa municipality a town of a projected population of 139,238 people, according to CBS, Garissa (2009) projections. However it is believed there is a large alien refugee population residing in town and its satellite zones, (CBS, Garissa ;2009), which has never been properly included in Population Estimates. The study area is situated in Garissa District, North Eastern Province in the Republic of Kenya.

For a variety of historical, cultural, climatic and contemporary regional political issues, the municipality has had to grapple with an ever expanding population. This coupled with archaic and static SWM practices by the Local Authority has confined the town environment to an ever increasing garbage blight and attendant unpleasant consequences.

For this reason, the municipality proffered for this study perhaps a ready opportunity of research and recommendations on strategic planning and SWM.

## 1 - 7; LIMITATIONS OF THE STUDY

Some of the most significant Limitations were:-

*7.1 Lack of adequate technical awareness on the research questions by both the municipal respondents and government worker- respondents.*

*7.2 Inadequate Finances*

*7.3 Inadequate Time*

## 1 -8 ;SIGNIFICANCE OF THE STUDY

The main justification of this study lies in the fact that no previous studies have been conducted on challenges of solid waste management in Garissa probably because only recently has it attained uncontrolled proportions. As such this area is a valid area of study.

While several studies have been done by various researchers none has conclusively assessed the root cause of such acute failure, more so in Garissa. A number of studies conducted by planners and scientists have concentrated on technical aspects of SWM with respect to methods (Otieno 1989; Mwangi 1990), while others have concerned themselves with specific reference to either residential estates (Mwaura 1991; Mbui 1995), or Industrial wastes (Fadamulla 1991). Mbui (1995) advocates greater participation of the communities among the urban poor but this alone has not proved to be sufficient. Such an approach is also advocated by Muthoni (1999).

Esho (1997) Makopa (1996) Moses (1996) and Kibwage (1994) have all extensively researched on privatization and its various aspects. However, privatization in Kenya has been known to have varying levels of success with the public sector criticized as not sufficiently sensitive to all factors that impact on efficiency and effectiveness (Esho, 1997).

Other writers such as Fadamulla (1991), Otieno (19989) Mbui (1995), Khadaka (1988), Macharia (1992), Kipkurui (1997), Geert (1996) and Mwaura (1991) have done largely exploratory studies in industrial and domestic solid waste.

Whilst noting the contribution made by these studies to our understanding of the magnitude of the Solid Waste Question, this study goes a step further to recommend solutions to the SW Question in a previously unstudied serious case situation, such as that of Garissa.

In addition, the literature of the Kenya Government regulatory Regime is awash with countless pieces of discordant legislations that has not helped solve the SWM problem either, chiefly because of lack of clarity and even worse, lack of enforcement. The problem of legislation will be further tackled in chapter 2.

In 2007, the Government of Kenya whilst consolidating the gains in the health sector among other areas towards attaining the MDGS, went further and promulgated Kenya Vision 2030. Touted as “.....a vehicle for accelerating transformation of our country into a rapidly industrializing middle – income nation by the year 2030.....” (Kenya Vision 2030; 2007). The Vision is pegged on six (6No) pillars among them the social pillar which outlines goals in Health Care Delivery. A unique feature of Kenya vision 2030 is the time bound, 5-year Medium Framework of attainment of goals.

According to Session paper No 6 of 1999 on Environment and Development, every person in Kenya is entitled to a clean and healthy environment (Kenya, 1999). Esho (1997) observes that SWM has long been taken for granted in Kenya and argues that the current practice is becoming inadequate.

Finally, the World Bank Development report (1993) notes that good health as people know it from their own experience is a crucial part of well being and further that improved health contributes to economic growth in a multitude of ways.

Thus this study on SWM for an improved health and aesthetics in Kenya’s urban environments is thus firmly anchored and justified.

## **1 – 9 ; ORGANIZATION OF THE STUDY**

This research was basically centred on Individual urban dwelling units of Garissa Town. The study was conducted in the form of a detailed literature review, a conceptual framework, research findings and analysis, recommendations and conclusion. This work is divided into Six (6 No) Chapters as follows:-

*Chapter 1: Introduction, problem statement objectives, limitations, significance and definitions,*

*Chapter 2: Literature review, Government policies, Global context and Conceptual Framework*

*Chapter 3: Research methodology, Design, Sampling Framework, Encumbrances, Interpretation and Case Studies*

*Chapter 4: The Study Area, (Garissa Municipality) Geography, Climate, History, Economy, Infrastructure and Roles of the Municipality Council.*

*Chapter 5: Research Findings, and Interpretations.*

*Chapter 6: Conclusion and Policy Recommendations.*

The Dissertation concludes with presentation of a list of, references and appendices.

## **1 – 10; DEFINITION OF KEY TERMS IN THE STUDY**

### **1-10.1 Urban Management**

Managing Urban Affairs For The Well Being Of Urban Dwellers In Provision Of Goods And Services. ([www.dictionary.com](http://www.dictionary.com))

### **1-10.2: Planning**

The Deliberate Act of formulating programmes for a definite course of action ([www.wikipedia](http://www.wikipedia), 2009)

### **1-10.3: Strategic Planning**

It is the special planning activity through which an organization confronts the major strategic decisions facing it. SP is a top down approach concerned with the long term or mission and objectives of an organization, the resources to be used to achieve those objectives and the policies and guidelines that govern the acquisition use and disposition of those resources ([www.wikipedia](http://www.wikipedia), 2009)

### **1-10.5 Solid Waste**

Refuse from households, non – hazardous waste (excluding sludged semi solids) from industrial, commercial and institutional establishments (including non pathogenic waste from hospitals) market waste, yard waste and street sweepings (schubeller; 1996).

### **1-10.6 Solid waste disposal**

Disposal of normally solid materials, resulting from human and animal activities. (Encarta Encyclopedia, 2006).

### **1-10.7 Solid waste management**

Involves activities associated with generation, storage collection, transfer, transport, processing and disposal of solid wastes which are environmentally compatible, adopting the principles of economy, aesthetics, energy and conservation. It therefore encompasses planning organization, administration, financial, legal and engineering aspects involving interdisciplinary relationships (Hide and Sunderaren 1983).

### **1-10.8 Community**

A group of people, bound by common values and objectives with basic harmony of interest and aspirations (United Nations; 1991)

### **1-10.9 Community participation**

Involvement of people in the identification of their felt needs, mobilization of their resources, influencing direction and execution of environmental programmes & projects (Habitat 1989).

NCED (1987) Defines community participation as a process through which a community mobilizes its resources, initiating and taking responsibilities for its own development activities and showing in decision making for and implementation of all the development programmes.

### **1-10.11: Governance**

In an organisation, governance relates to consistent management, cohesive policies, processes and decision-rights for a given area of responsibility for example public Affairs. ([www.dictionary.com](http://www.dictionary.com))

### **1-10.13: Decentralization**

Shifting of responsibility of planning and implementation of service delivery to lower tiers of government and/or organization ([www.dictionary.com](http://www.dictionary.com))

### **1-10.13 Urban infrastructure**

Urban Infrastructure is defined as those services derived from the set of public works traditionally supported by the public sector to enhance private sector production and allow household consumption (Fox 1994).



## **2.0 CHAPTER TWO:**

### **- LITERATURE REVIEW & CONCEPTUAL FRAME WORK**

#### **2-1 INTRODUCTION**

This chapter comprises Literature review, and examines existing literature, identifies gaps in previous works by others and closes with the formulation of a conceptual framework for the study.

#### **2-2 URBAN ENVIRONMENTS & SOLID WASTE MANAGEMENT**

Cities have been in existence since ancient times. The progressive Civilization of Humanity led to interactions through trade, which in turn led to development of Trade Routes. Inevitably, centers of trade and Dwelling inevitably emerged, and distinct City-building eras such as Greco-Roman, Middle-Ages, Baroque, Renaissance, Industrial Times and the Modern eras are discernible. Urban centres arise when people cluster together in a regulated close knit society for economic convenience purposes.

Urbanization through the ages has had characteristic problems directly related to human Population Growth, and these have attained critical form and focus in the so called modern Megalopolis.

The world's population reached 6 Billion in 1999, A UNCHS (2002) report recently indicated. An overwhelming share of this growth took place in Africa, Asia and South American countries. The population of these countries has also more than doubled in 35 years growing from 1.8 9Billion in 1955 to 4.13 Billion in 1990.

Urban areas have absorbed significant proportions of population increases in these regions and currently cities in Africa, Asia and S. America are growing five times as fast as those in Europe

do. Already, they are experiencing enormous problems in shelter, infrastructure and services as they are increasingly over crowded (UNCHS, 2002).

In globalization of the economy, particularly with regard to financial services, commerce, transportation and telecommunication, cities are taking on significant roles (UNCHS; 2002). Larger and larger proportions of the population live in cities with populations of one million and above. In Europe, North America and Australia, 26% of the total population, lived in such cities in 1990, compared with 19% thirty years ago. At this rate, the world will have seven billion people by 2010, according to UNHCS (2000) estimates.

In the African, Asian and Latin American, this increase is even more pronounced; in these Countries, population growth more than doubled from 5% in 1960 to 12% in 1990.

The concentration of urban populations in cities with populations of one million and above is becoming particularly characteristic of countries in Africa, Asia & America. In 1990, for example 36% of the Urban population of these countries lived in such cities compared to 22% in 1950. By the year 2015, it is projected that 22% of the worlds total population, and 41% of the world urban population will live in cities with populations of one million and above ( UNCHS; 2000).

The population situation is further complicated by informal settlements phenomenon in Developing Countries (DCs) and Least Developed Countries (LDCs). Sub-Saharan Africa has world's biggest Urban Population living in slums. Slums house 72 % of Urban Africa's citizens, now well above 190 Million. Further annual urban Population growth rate is all time high 4% according to UN statistics. Currently, 37 % of Africans live in Urban Centres, and this is expected to rise to 53 % by the year 2030 AD.

One major problem afflicting our Urban Environments largely, and our Rural Environments to a lesser extent, evolves around the collection and disposal of unwanted Solid Waste (variously referred to as refuse, garbage, litter, etc) generated by numerous, unique activities comprising the population's existence and activities in dwelling and work environments.

The average waste generated in municipalities the world over, measured per person per day, ranges from 0.25 (Least Developed Countries) to 2.3 kg (Highly Developed Countries). This clearly illustrates that there is a direct relationship between per capita incomes and the generation of waste.

Poorly managed cities and towns contribute to unsustainable production and consumption patterns, and have negative impacts on environment conditions. They also generate unmanageable waste, which negatively impact on land and waste resources as well as on the atmosphere. A large proportion of the world's population remains deprived of basic services such as water supply and SWM. The marginalized population is particularly large in those cities In Africa Asia and S. America. In many of these countries, the rates of urbanization far exceed the carrying capacity of national and local governments (UNCHS; 1996) .The absolute level of resources available to local governments in these countries is seldom adequate to provide even the minimal level of service such as solid waste management. (Ochieng; 2004).

Thus sustaining a healthy environment in the urbanized world of the 21<sup>st</sup> century represents a major planning challenge for human settlements, development and management (UNCHS 1996).

## **2– 3 HUMAN HABITAT & ENVIRONMENT;THE EFFECTS OF SOLID WASTE**

SW is an inevitable output of human activities (Ochieng, 2004). Either they are a by-product of primary production or they arise when objects or new materials are discarded after they have

been used. Waste is an inevitable part of the natural process. Esho (1997) asserts that if not properly handled, solid waste can result in health hazards.

Urban environments have been long found to represent Engines Of Economic Growth (Mbui, 1995). For this reason, cities, increasingly have networks of linkages that extend far beyond their boundaries, yet failure to manage impacts of rapid urbanization, including solid waste generation, is threatening human health, environmental quality and urban productivity. Urban solid waste like all waste generally is by definition of little or no value too the generator (Van tassel 1970) and such there is little incentive to handle it in a careful manner and on the whole, there is an in-built temptation to relinquish responsibility for it at the earliest opportunity.

Sustainable urban development requires consideration of the carrying capacity of the entire ecosystem supporting such development including the prevention and mitigation of adverse environmental impacts occurring outside urban areas. The unsafe disposal of waste leads to the degradation of the natural environment aquifers, coastal zones, ocean resources, wetlands, natural habitats, forests and other fragile ecosystems which are the homelands of indigenous people UNCHS (2000).

The sheer size of global expenditure on health makes it critical to understand the impact of government policy on people's health (World Bank 1993).The diseases associated with (unhealthy) household environments occur mainly in DCs and here they account for nearly 30% of total burden of diseases (Walt, 1994) .

Myriad environmental hazards arise from uncollected garbage (Abiero, 1999) They form ideal places for breeding of flies which spread *dysentery*, *cholera*, *typhoid* and other food diseases

**Plate 2-1; Refuse dumped in Stagnant water along a road in Garissa Ndogo Area in Garissa**



Source: Author, Field Survey, 2009

**Plate 2-2 ; Waste being incinerated at site near catholic church, Garissa**



Source: Author, Field Survey, 2009

**Table 2 - 1; Estimated burden of disease from poor household environments in developing countries, 1990, and potential reduction through improved household services.**

Principle disease related To poor household Environments	Relevant environment problem	Burden from these Diseases in develop- ing countries (millions of DALYs per year)	Reduction achievable through feasible interventions (percent)	Burden averted by feasible interventions (millions of DALYs per year)	Burden averted per 1,000 population DALYs per year
Tuberculosis	Crowding	46	10	5	1.2
Diarrhoeas	Sanitation, water supply hygiene	99	40	40	9.7
Trachoma	Water supply, hygiene	3	30	1	0.3
Tropical clustered	Sanitation, garbage disposal vector breeding around at home	8	30	2	0.5
Intestinal worms	Sanitation, water supply hygiene	18	40	7	1.7
Respiratory infection	Indoor air pollution crowding	119	15	18	4.4
Chronic respiratory disease	Indoor air pollution	41	15	6	1.5
Respiratory tract cancers	Indoor air pollution	4	10		0.1
All the above		338		79	19.4

Less than one

Note: The demographically developing group consists of the demographics regions Sub-Sahara Africa, India, Other Asia and Islands Latin America and the Caribbean, and Middle Eastern crescent.

a. The diseases listed are those for which there is substantial evidence of a relationship with the household environment and which are listed in Appendix B. example of excluded conditions are violence related to crowding (because of lack of evidence) and guinea worm infection related to poor water supply (not listed in Appendix B).

b. Estimates derived from the product of the efficiency of the intervention and the proportion of the burden of disease that occurs among the exposed. The efficacy estimates assumed the implementation of improvements in sanitation, water supply, hygiene, drainage, garbage disposal, indoor air pollution, and crowding of the kind being made in poor communities in developing countries.

c. Includes diarrhoea, dysentery, cholera, and typhoid.

d. Disease within the tropical cluster most affected by the domestic environment are schistosomiasis South American trypanosomiasis, and Bancroftian filariasis.

e. Based on every inadequate data on efficacy.

Source: Appendix tables B.2 and B.3 and authors calculations.

SOURCE: Walt, 1994

arising from food contamination. They also form breeding ground for the mosquito, the vector responsible for *malaria, dengue fever, yellow fever* and *elephantiasis* (See Plate 2-1). Additionally, garbage heaps form ideal habitats for proliferation of vermin such as rats which are vectors of *plague, leptospirosis, flea-borne-typhus* and *salmonellosis* (Abiero, 1999). Further, accumulated waste (upon putrefaction) can cause pollution to both surface and ground water. Water as is well known represents the basic medium for practically all physiological life processes.

In the Developing Countries(DCs) and Least Developed Countries (LDCs), incineration (See Plate2-2) is the method of first choice. For all manner of refuse, and all waste tends to be lumped together, and set on fire (Abiero et al; 1999). Emissions of incineration including at best *Respiratory and Gastro – Intestinal complications*, and on the other hand at worst, dangerous, mostly potentially carcinogenic, fumes. (See Plate 2-2).

The World Bank Development Report (1993) comments on the individuals lost economic output and earnings and goes on to observe that yet developing countries (DCs) continue to suffer a heavy burden of disease, much of which can be in expensively prevented or cured (See Table 2-1). The report rightly sees healthier workers as being able to earn more because they are more productive and can get better paying jobs.

The National Development Plan (1994) of the Government of Kenya says all development must be sustainable. Additionally in line with the Riode Janeiro resolutions (1992), all developments must be sustainable and the Rio conference defined sustainability as “...being able to meet the needs of the present generation without jeopardizing the resources for the future generations...”(Agenda 21, Rio de Janeiro; 1992). Ochieng (2004) sums up that

insufficient collection and inappropriate disposal of solid waste represent a source of pollution and risk to human health in urban settlements. Kipkurui (2007) concludes that the creed of industrialization first, before taking environmental care has to dissipate.

## **2 - 4 THE PHENOMENON OF SOLID WASTE IN URBANIZED KENYA**

### **2 - 4.1 RAPID URBAN GROWTH**

According to Obudho (1982), the rate of urban in Kenya is among the highest in the world. While the estimated annual growth rate of urban population in Kenya is at 7.05% for the period 1995 – 2000, the average for African cities is 4.3% and 2.57% for the world. This has overstretched the capacity of infrastructure and services in large towns, to the extent that many people have to squat or live in slums.

Obudho (1982) further observed that although Kenya is still predominantly rural, there is a high tendency towards urbanization. He further reports that the annual rate of increased urban population was 0.2% during 1948 – 62, and 0.5% during 1969 – 79 (Obudho 1982).

At the time of the first Kenya population census in 1948, there were 17 towns with aggregate population of 276 249 by 1962 census, the number of towns had increased to 670 & 50, with an urban growth rate of 6.6% per annum. This represented the urbanization level of 7.7%. According to the 1969 and 1979 population census there were 48 and 91 urban centres respectively. During the 1962 – 69 intercensal periods, the urban population doubled. The population grew from 670 950 in 1962 to 1,082 437 in 1969, increasing at a rate of 7.1% per annum, in 1969 urban dwellers represented 9.9% of the total population. The 1979 population census indicated of urban centres with an urban population of 2,238,800. The level of urbanization had risen to 14.6% representing more than a doubling of the total urban



population in about 10 years of 7.9% per annum during the 1969 – 79 intercensal periods. (Obucho 1982).

#### **2 – 4 .2; KENYAN URBAN ENVIRONMENTS & SOLID WASTE**

According to Session paper No 6 of 1999 on Environment and Development, Kenya is committed along the ideas sustainable development. Every person in Kenya is entitled to a clean and healthy environment and has therefore a duty to safeguard and protect it (Kenya, 1999). The goal of the Government of Kenya is therefore to integrate environment concerns into the national planning and management system as well as provide guidelines for environment sustainable development.

Yet Kenyan cities have not been spared from the experience of environmental (and health) problems associated with SWM. Like other developing countries a high rate of growth attends especially to medium sized cities (Otieno, 2003) .Locally, upgrading of local authorities is always done without considering whether or not the concerned local authority would cope with the new responsibilities including that of managing solid wastes generated by the additional population (Ochieng, 2004) .

Seasonal paper No. 10 (1965) is the anchor of Kenya industrial development and its policy of “. . . stimulating growth and potential for commerce in Kenya through an inward looking policy of input substitution for consumer goods . . . ” was aimed at enabling citizens to improve their standards of living. Unfortunately, industrialization has engendered generation of huge volumes of Solid Waste that pose a great health, sanitation and enormous structural problems (Abiero 1999). The reason for this is that industrial firms are primarily concerned with profitability of their ventures and tend to be blind to the side effects.

Kipkirui (1997) observes that no municipality in Kenya has provided elaborate disposal sites for both domestic and industrial wastes. Shirley (1991) adds that these municipal governments such as are in Kenya are usually attended by lack of adequate skilled manpower for maintenance of waste collection fleet. (Cointreau, 1994) decries the “. . . . burdensome bureaucratic procedures that constrain spare parts acquisition, thus bogging down repair operation and consequently strangling waste collection and disposal processes . . . . .”

The situation for medium towns, ie municipalities, such as Garissa is more precarious than that of cities such as Nairobi because as Mabogunje (1999) observes, large cities tend to slow down in their growth and medium sized cities take over as the main loci for rapid expansion. This is accompanied by deterioration in physical infrastructure and services such as solid waste management as the extension of urban services fails to keep pace with growth in demand.

The situation of Municipalities in DCs and LDCs like Kenya is further worsened by many informal settlement that now exist within urban areas KUESP (1997) sees these settlements as emerging from unfavourable economic conditions, under-investment in urban infrastructure, high natural growths and rural-urban migration, (Esho, 1997). 60% of residents of most large cities of Africa, Asia, and South American Countries live in such informal areas. A UNCHS (1986) global report on human settlements pointed out that between 30% and in informal settlements for majority of world poor decent shelter remains a luxury. In Kenya, approximately 60% of the urban dwellers live in informal settlements. In the city of Nairobi alone, though the urban poor make up 55% of the total population, they only occupy 5% of the total residential area (UNCHS, 1986). Inevitably, waste generation in

such cities is unbelievably high, with estimates that average per capital waste production as 0.70 kg per day.

### **2 - 4.3; LEGISLATION & POLICY REGIMES**

Kenya's Development Policies have favoured industrial development without giving commensurate emphasis to environmental health. Government policies since independence have largely been silent and the first ever mention of environmental issues was in the third National Development Plan (1974 – 1978) and this is seen to have been a response to the United Nations Conference in environment & development held in Stockholm, Sweden in 1973 (Kipkurui; 1997 ).

Kenya established a National Environment Secretariat (NES ) in 1974 as a watchdog and later created a Ministry of Environment in 1978. Later the Government expanded NES into National Environment Action Plan (NEAP) with role of policy formulation.

Again after the Rio de Janeiro United Nations Conference on Environmental and Development (1992) which promulgated Agenda 21 – the search for solutions to the apparent conflict between development and environment – the Kenya Government produced the 7<sup>th</sup> National Development plan in 1994 with the bold theme “Resource Mobilization or Sustainable Development” Kipkurui (1997) argues that this is probably the only development plan where environmental issues are given substantial coverage and emphasis. The whole of chapter 5 is devoted to environmental issues and in it the Government boldly asserts that “. . . all development must be sustainable . . . . “

Subsequently Policies and Development plans have largely focused on environmental–friendly techniques rather than arresting industrial population (Kipkurui (1997) ).

#### **2-4.4; EXISTING LEGISLATION IN KENYA**

Existing legislative Framework relates to SWM through specific Acts that touch on industry, population and environment. However, environmental issues are scattered in sixty six (66 No) diverse sections and legislators are perennially lamenting about absence of strong legislation on environmental matters every financial year as they debate the Ministry Of Environment Budget.

The various pieces of legislation are scattered within various diverse Acts such as :-

- **Public Health Act (Cap 842)**
- **Water Act (Cap 372)**
- **Pests Control Products Act (Cap 346)**
- **Radiation Protection Act (Cap 243)**
- **Mining Act (Cap306)**
- **Factories & Other Places of Work Act (Cap514)**
- **Adoptive Laws (By-Laws)**

#### **2-4.5; SOME OF THE PIECES OF LEGISLATION IN THE LAWS OF KENYA.**

##### **2-4.5.1; The Public Health Act Cap 242**

###### *The Public Health Act Cap 242 - Sec10(2):*

Here the Act discusses the public health in the Local Authorities but the generality renders the reference to the Solid Waste Question to remain only peripheral.

###### *The Public Health Act Cap 242 - Sec 15:*

The Public Health Act in this section also seems to also invite a lengthy approval process as well as Red Tape.

###### *The Public Health Act Cap 242 - Sec 116:*

The Public Health Act in this section by far offers the best effort at specifically mentioning the attitude to cleanliness in towns.

*The Public Health Act Cap 242 - Sec 118(1)(c):*

The Public Health Act in this section and subsequent sub-sections (as appearing in Appendix 8), more specifically describes the desirable state of cleanliness in towns, but is largely in exhaustive.

**2-4.5.2; The Environment Management & Co-ordination Act (1999);**

*The Environment Management & Co-ordination Act (1999);Sec 87:*

This section of The Environment Management & Co-ordination Act (1999) dwells on the disposal of waste and pollution, and for the first time ever, specifically mentions modern methods of SWM, including waste re-clamation and recycling. However the Act is was enacted much more recently as compared to all others, and as such it is yet to attain its maximum effect on the Solid Waste Situation in Kenya's Town including Garissa.

**2-4.5.3; The Local Government Adoptive By-Laws**

*The Local Government Adoptive By-Laws Sec 238 (2)*

The Local Government Adoptive By-Laws in this Section, and subsequent subsections, outlaws the depositing of debris, materials and other items associated with building industry in a wanton manner, without regard to safety and tidiness.

Further, although the Local Government Act, Cap 265, of the Laws of Kenya gives the Ministry for Local Government powers to establish local authorities, it has failed to come up with the necessary guidelines for deciding how such boundaries should be extended (Ochieng 2004).

**2-4.5.4; Other Acts :**

Other Acts touch the Solid Waste question to varying degrees of emphasis. The Public Health Act Cap 243 only vaguely requires the Local Authorities to maintain cleanliness. The

Factories Act deals only with the safety in factories without mentioning the wider environmental aspects which the industries find themselves in.

Clearly, there is thus currently no integrated government approach on waste management. Session Paper No.6 of 1999 on Environment & Development by the Ministry of Environment and Conservation confirms this by stating that there is no comprehensive policy on waste management.

#### **2 – 4.6; CASE STUDIES; THE SWM SITUATION IN KENYAN TOWNS**

Kenya's Towns are governed under an elaborate system of Semi-Autonomous Bodies known as Local Authorities (See Box 2-1).

##### **2 - 4.6.1 Garissa Municipality**

The Study area of Garissa is the first town of mention as being beset by an immense refuse problem. Unsightly heaps of garbage litter almost every backyard, street and drainage canal. (See Plates 2-3, & 2-4) The problem of Garissa will be further tackled in chapters 4, 5, and 6.

##### **2 - 4.6.2 Nairobi City**

Nairobi has for years grappled with a huge the Solid Waste problem. Reliable records indicate that SW had increased from annual total of 165,222 tonnes in 1973 to 365,675 tonnes in 1998. (Otieno 1992). However within the same period the amount of solid waste collected as a percentage of the total has been reducing (From 98.32% in 1973 to 21.54% in 1998.

Reasons cited are largely two fold, careless handing of waste and failure to organize collection schemes. (See Tables 2-2, & 2-3) Unsightly heaps of rotting refuse in

**Plate 2 – 3; Garissa & Garbage; Goats scavenging in an Unofficial Dumpsite at Bulla Sheikh Area.**



Source: Author, Field Survey, 2009

**Plate 2 - 4; Non-bio degradable type of waste abound at the Garissa land fill**



Source: Author, Field Survey, 2009

**Table 2-2: Frequency of collection of waste in Nairobi City Council**

AREA (NRB)	FREQUENCY OF COLLECTION
High income	Once per week
Middle Income	Once per two weeks
Low Income	Not regular

Source: Cleansing Section NCC ;2009

backyards, streets, shopping centres are the daily. Worse, residents tend to spill and spread waste indiscriminate if it goes uncollected for extended periods. (Otieno 1992).

**Table 2-3; History of collection of waste in Nairobi City Council (Note the incompleteness of Record-Keeping, a Hallmark of Mismanagement)**

Year	Collection
1974	173783
1975	192092
1976	186524
1977	202229
1978	197619
1979	136906
1980	187595
1981	178834
1982	178136
1983	159974
1984	144650
1985	136805
1986	-
1987	-
1988	-
1989	-
1990	-
1991	-
1992	144000

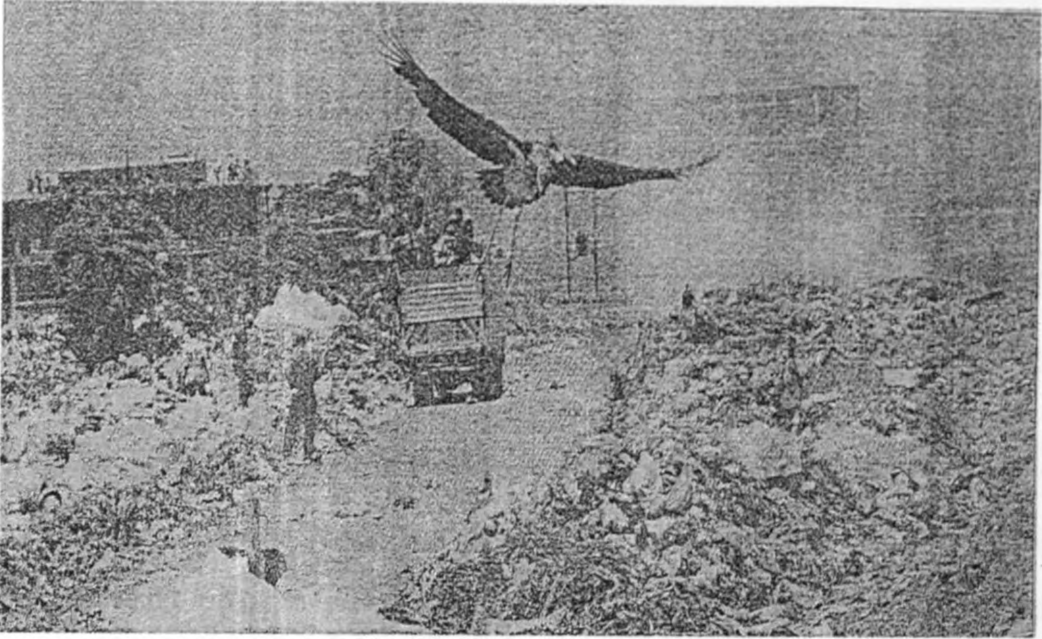
Source: Cleansing section NCC ;2009

Thus the solid waste in the capital city is enormous (See Plate 2-5). Estimates say about 1,000 tones of waste was being produced daily by 1997, and currently the figure is uncertain because of unreliable record-keeping but could be around 1800 tonnes.

The City Council has recently invited private agencies to bid for collection & transportation. In another tender, also for private companies, the winner(s) will be expected to perform high quality sanitary landfills, recovery, recycling, and treatment of waste. (The Standard; October 22<sup>nd</sup> 2007).



**Plate 2 – 5 ; SWM problems in Nairobi, Dandora Dumpsite**



**Source;** The Standard; October 22<sup>nd</sup> 2007

**Plate 2 – 6; SWM problems in Eldoret**



**Source;** The Standard; April 15<sup>th</sup>, 2009

In this new strategy the NCC 's Environmental Department will only play a regulatory role only. It will require the designated Solid Waste Operators to work under the following conditions ;

- **They should be registered with the National Environment Management Authority**
- **They must have at least thirty waste transport vehicles among other accessories**
- **They must be able to finance themselves.**
- **They are to recover the cost by a set of approved levies/ fees to city residents**
- **The council will then pay them for services per unit weight of garbage**

A further bold move on the Solid Waste improvement will see the NCC outsource the construction of a modern sanitary dumpsite at Ruai which will enable relocation of the thirty year old dumpsite at Dandora which has outlived its usefulness and become a health and environmental hazard. .(The Standard; October 22<sup>nd</sup> 2007).

#### **2 - 4.6.3; Mombasa City, Kenya :**

Also besieged by the Solid Waste problem, this council only manages to collect 300 out of 800 metric tonnes of solid waste it generates daily which represents only 37.5% (The Standard; Wednesday, April 15<sup>th</sup> , 2009).

As such it targets to fully privatise and is currently in the middle of the procurement to nominate Solid Waste Operators. It subsequently intends to reduce staff levels by six hundred and these workers may be absorbed by the SWOs. Further it is rehabilitating the *Mwakirunge* Dumpsite through the sponsorship of the French Development Agency (FDA). (The Standard; Wednesday, April 15<sup>th</sup> , 2009).

### Box 2-1; Local Authorities in Kenya

#### LOCAL AUTHORITIES IN KENYA

Local authorities in Kenya are the bodies controlling local governance in Kenya.

Kenya has four classes of local authorities: City, Municipality, Town and County council. Currently there are three authorities with city status: Nairobi, the national capital, Mombasa and Kisumu. A Municipalities and towns are other forms of urban authorities and are generally named after their central town. County councils are essentially rural. Each district has a maximum of one county council, such that they cover all area not taken up by urban authorities. County councils are usually named after their respective districts, which often bear the same name with its district capital. Thus county councils are often named after a major town, but their land area may not cover the town itself but its surroundings. Some districts have only one local authority, which are county councils, apart from few exceptions.

Local authorities usually differ from divisional and constituency boundaries used by the state administration.

Local authority administration consists of a Mayor, Town clerk and councilors. The numbers of councillors depend on population and area of each authority and they are elected by the public during the Kenya general elections held every five years or by-elections held in between. Authorities are divided into wards and each ward elects only one councilor. Wards have often common boundaries with administrative locations.

Compared to many other countries, local authorities in Kenya are weak and are shadowed by state run administration. However, during the International Africa Cities Summit held in Nairobi September 2006, the Kenyan President Mwai Kibaki promised to strengthen local authorities.

Kisumu and Mombasa, which currently have municipal councils have recently been granted city status, but they are yet to get their city charters .

Source: Kenya Govt; Ministry of Local Government

#### 2 - 4.6.4 Kisumu City, Kenya :

Kisumu Municipal Council running a town of population 500, 000, is also trying to cope with the Solid Waste problem. (The Standard; Wednesday, April 15<sup>th</sup>, 2009). This council only manages to collect 20% of the 200 metric tonnes of waste it generates daily. Uncollected waste is visible especially in the informal settlements of *Bondeni, Nyalenda, Manyatta*,

*Nyamasaria, and Obunga.* The main cause is resident's attitude where most have a tendency to randomly dump outside and leave it to rot, while only a few opt to burn it outside with often messy results. (The Standard; Wednesday, April 15<sup>th</sup>, 2009).

However, the municipal council is by and large effective in affluent neighbourhoods such as Milimani, the Central Business District as well as its environs. Other actors are private firms which charge from Ksh 100 to Ksh 200 per household per month. They are very few and face major problems in finance and relevant equipment. The main municipal dumping site near *Moi Stadium* is outdated and now poses a Health Hazard and the Municipal Council is prospecting for a replacement under the sponsorship of Swedish International Development Agency, SIDA.

To improve on SWM, the UN Habitat in 2008 unveiled a Scheme christened The Kisumu Integrated Sustainable Waste Management Project. Designed to improve SWM through Public-Private Partnership, the Project aims to offer credit guarantee schemes to Groups dealing with Solid Waste with the ultimate aim of reducing SWM problem by 20%. It is expected to last eight months and cost Ksh 68 million. (The Standard; Wednesday, April 15<sup>th</sup>, 2009).

#### **2 - 4.6.5 Conclusion**

As can be deduced from this discussion the scope, nature and status of current legislation is of little assistance, if any, to the SWM situation of our Municipalities in Kenya.

Clearly there evidently lacks a consolidated Policy on SWM that harmonises the various pieces of Legislation, scattered in various Laws and By-laws, and that embraces contemporary trends in SWM such as recycling/recovery/reuse. Any formative action and/or

corrective Litigation and sanctioning of offenders always relies on a fall-back to these varied Acts of the Laws of Kenya.

A complete change of Laws and Policies both at national and local levels is required for cleaner living environments. Kipkirui (1997) calls for an all-encompassing environment law and (Esho;1997) calls for greater enforcement of legislation and control measures.

## 2 – 5; SOLID WASTE MANAGEMENT IN A GLOBAL CONTEXT

In city environments, Solid Waste Services absorbs a considerable proportion of municipal budgets and workforce. However Government are increasingly aware that the poor solid waste collection and environment protections in towns and cities makes it difficult to justify prevailing levels of municipal expenditure in this sub sector (Ochieng, 2004). Thus there are increasing calls to improve efficiency in the disposal and management of solid wastes in urban centres.

Generally, the average waste generated in municipalities the world over, measured per person per day, ranges from 0.25 (Least Developed Countries) to 2.3 kg (Highly Developed Countries). This as noted earlier clearly illustrates that there is a direct relationship between per capita incomes and the generation of waste. (See Table 2-5).

**Table 2 – 4 ; Patterns of Urban Solid Waste Generation**

SOLID WASTE CHARACTERISTICS	LOW - INCOME COUNTRIES	MID - INCOME COUNTRIES	INDUSTRIALIZED CS
Waste generation kg /capita /day	0.4 – 0.6	0.5 – 0.9	0.7 – 1.8
Waste densities (wet basis kg/m <sup>3</sup> )	250 – 500	170 – 330	100 – 170
Moisture content % weight at point of Generation	40 – 80	40 – 60	20 – 30

SOURCE; Cointreau (1982)

From their modest historical origins, today's cities have been changing in size; spatial organization and distribution of public services and infrastructure. (Fox 1994) asserts that the general consensus is that infrastructure plays a vital role in stimulating economic development, and attracting investments. Esho (1997) adds that the decision by investors, labour, and others to invest work or live in a place is greatly influenced by the availability of adequate and appropriate infrastructure.

### ***2 - 5.1 SOLID WASTES MANAGEMENT IN CITIES OF DCs & LDCs***

As stated earlier, waste management in DCs and LDCs is beset by numerous technological, financial, and governance constraints. In these Cities, inadequate financial and technical ability have rendered Municipal Governments incapable of carrying out efficient solid waste management and this exposed inhabitants to life threatening situations and ill health as well as rendering urban environments aesthetically unattractive to both investors and tourists. Thus solid waste management in such cities is among the most critical issues affecting developing countries (E. Thomas –Hope, 1998). Esho (1997) while agreeing notes that in DCs and LDCs, poor performance both in terms of quantity and quality confronts urban infrastructure services.

Kibwage (1994) adds that urban government are seriously challenged in service provision due to diminishing resources. Otieno (1992) adds lack of awareness among residents and inadequate technical capacity to this list of woes bedevilling Municipal Agencies CMA (1992) cites too much control from central governments especially on funding, irregular waste collection cycles, competing demands and even changing National Agenda as additional culprits.

Runaway urban population growth as seen earlier has brought about huge volumes of waste output In Africa, and especially in Sub-Sahara Africa, 37% of Africans population lives in urban centres and it is estimate the figure will rise to 53% by the year 2030.

Sub-Sahara Africa also has the dubious distinction of having the world's largest population of urban residents living in slums (Habitat 2004). In Nairobi, for example informal settlements account for 60% of the total urban resident population (KUESP, 1997). Further 72% of urban Africans citizens (187 million) live in slums.

The inevitable result is that in African Countries as well as most LDCs and DCs, less than 10% of urban waste output receives any attention and such treatment is only minimally in compliance with any acceptable quality standard (Kipkurui 1997)

Dillinger (1994) adds absence of effective governance and Habitat (1994) decries the exacerbation of financial woes due to loss of foreign exchange due to heavy dependence on imported hardware and expertise for SWM.

For example, most municipalities in India spend 30 – 50% of their Municipal Budget on SWM but are unable to provide adequate SWM services. This inadequacy is believed to arise primarily from lack of community involvement, improper technological choices and institutional weakness. (Panaji, 1993).

Another significant contributor to SWM problem is the tolerant attitude by SW regulatory authorities imposed on these Countries by circumstance of poverty. Because so many people are engaged in the activities of material recovery processing and recycling, and alternative work is scarce, Medina (1997) argues that some governments and social welfare

organizations are more often sensitive to employment needs than environment considerations in waste management. Thus they are prepared to trade of some environment and public health concerns against employment generation.

Waste Collection Strategies are equally compromised, and success thereof ranges from authority to authority. Worse, waste generation is characterised by lack of reliable data on generation, amounts, levels of pollution and identity of polluters.

#### 2-5.1.1 Non-Collection Strategies

Non- Collection Strategies Represents virtual absence of Central Control and is mostly common in peri-urban areas. The community throws raw un-sorted waste at points on average about 50 metres from their doorsteps. The waste is then partly consumed by domestic animals such as hens, goats, pigs, cows, etc.

The remainder of the waste is then incinerated by community volunteers. One major drawback is the tendency for strewn waste to rot especially in wet weather prevalent in tropical climates, as well as frequent infections arising from wind blown particles.

#### 2-5.1.2 Collection Strategies

Pro-active authorities in The South sometimes invest significantly in Collection Activities.

These include some or all of the following:-

- Door to Door collection: where waste is picked very close to source, inside containers and bins, preferably by vehicles which then empties into trucks or direct to dumpsites
- Kerbside collection: where the trucks collect waste from along the street where waste generation agencies await or time them.



- *Block collection: where* local authority trucks arrive at specific venues, times, and days to collect waste from urban dwellers who store and bring waste in bins. The method is more efficient as it reduces number of stops for vehicles.
- *Community Deposits collection: where* households carry waste out to pre-established neighbourhood deposits. This not only reduces truck stops , but also allows waste collection in narrow areas impenetrable by trucks. This is practised by Nairobi City Council and other Municipal Authorities in Kenya

### 2-5.1.3 Summary Of Challenges In Waste Management In Cities In The South & In Kenya In Particular

As can be deduced from this discussion the scope, nature and status of current legislation is of little assistance, if any, to the SWM situation of our Municipalities in Kenya.

As stated earlier, waste management in LDCs is beset by numerous hindrances including but not limited to the following;

- 1) Lack of adequate Financial Resources & Foreign Exchange reserves,
- 2) Lack of relevant waste management technology and /or deployment of mediocre equipment due to out datedness and/or old age.
- 3) Lack of adequate Public Education/ Awareness among the cities' dwellers on their rights on one hand and duties on the other.
- 4) Poor physical/ spatial configurations of urban matrix, wrought by mediocre or non-planning, rendering vital aspects of solid waste management such as transportation inoperable.
- 5) Cultural constraints among the towns' dwellers including, in some extreme cases, eccentric attitude to waste accumulation as something to be dreaded/shunned, rather than positively confronted.
- 6) In-ordinate exposure to risks associated with poor waste management. These include air borne particles giving rise to potential respiratory infections, as well as potential contamination of ground water, which, when accessed via drilled wells, happens to be a significant source of drinking water in mostly poorly supplied neighbourhoods of urban centres.

Another lesser known risk is associated with the institution of 'human scavengers'. These are trade speculators who flock to areas of aggregated garbage sites, mostly landfills, to sort and cart away choice waste items for reuse/resale. Research has shown this category to frequently suffer form diverse respiratory, and pollution related diseases, as well as infections characteristic to contact with wetness & stagnant water.

## **2 - 5.2 SOLID WASTES MANAGEMENT REALITIES IN CITIES OF HIGHLY DEVELOPMENT COUNTRIES**

The history of SWM in HDCs is as old as the history of industrialization and the advent of manufacturing and packaging. In the recent past packaging comprised durable containers that could be fed back into the industrial production line (Van Tassel, 1970). Today a rise in living standards finds Urban dwellers (especially in HDCs) discarding as much packaging materials as possible. Van Tassela (1970) sees consumers as even willing to pay premium charges on goods for the convenience of throwing away a container.

Brandt (1987) sums up that these Industrialized Countries generate 90% of the worlds waste. For example, the EPA estimates that the Average American produces 0.75 tons of trash a year 2.05 kg per year (Njau 04).

### **2-6: SOLID WASTE MANAGEMENT; STANDARDS OF BEST PRACTICE**

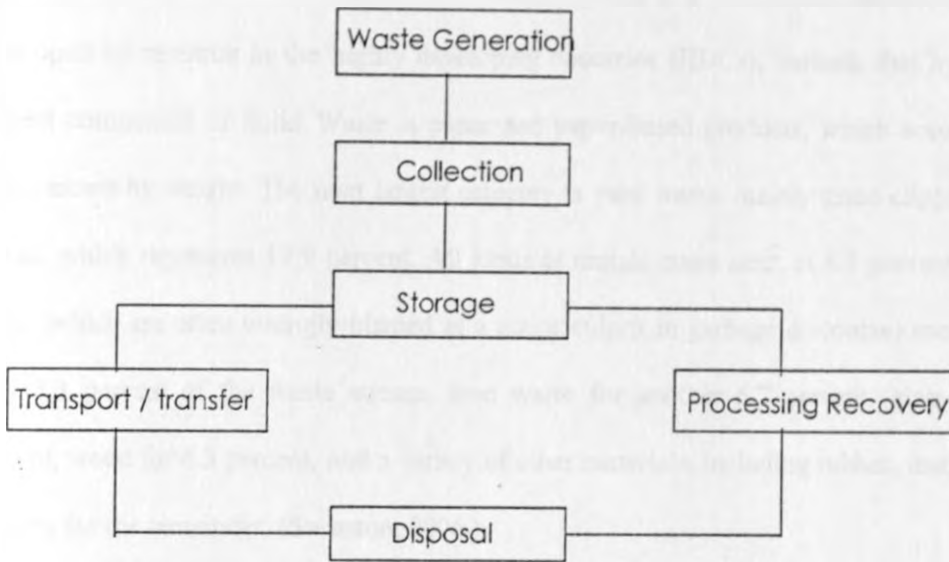
#### **2-6.1: WASTE GENERATION**

A society's way of life is a direct reflection of the amounts and morphology of the solid waste generated by that society. The entry point of waste management is generation.(See Fig 2-1)). One major problem afflicting our Urban Environments largely, and our Rural Environments to a lesser extent, evolves around the collection and disposal of unwanted Solid Waste generated by numerous, unique activities comprising the population's existence and activities in dwelling and work environments.

#### **2-6.2; REDUCTION OF WASTE GENERATION**

It is more desirable to create less Solid Waste in the first place, than it is to create efforts to manage it. This strategy is concept commonly referred to as Source Reduction. (Swanson; 2006) This approach is only just commencing.

Fig 2 – 1: Simplified Diagram, showing the process of solid waste management from collection to disposal.



SOURCE: Tchobanoglous: (1997)

One way of encouraging Source Reduction is to charge customers for garbage collection based on the amount of garbage they produce rather than imposing a flat fee in Municipalities.

Additionally, Business and industry are encouraged to implement pollution prevention programs that aim to replace toxic or hazardous materials used in manufacturing with safer products or to recycle hazardous materials within a factory so as to get more use out of the same amount of chemicals.

### 2-6.3; WASTE CLASSIFICATION

Solid Waste may be broadly classified according to the following self-explanatory categories;

- *Bio-degradable versus Non-biodegradable*
- *Combustible versus Inert*
- *Clean versus Hazardous*

### 2-6.3.1: Classification by Composition

Waste may also be classified as per composition See (Fig 2-7). Current statistics, largely developed by research in the highly developing countries (HDCs), indicate that by far the biggest component of Solid Waste is paper and paper-based products, which accounts for 37.5 percent by weight. The next largest category is yard waste, mainly grass clippings and leaves, which represents 17.9 percent. All kinds of metals come next, at 8.3 percent. Plastic items (which are often wrongly blamed as a major culprit in garbage discourse) account for only 8.3 percent of the waste stream, food waste for another 6.7 percent, glass for 6.7 percent, wood for 6.3 percent, and a variety of other materials, including rubber, leather, and textiles, for the remainder. (Swanson; 2006 ).

### 2-6.3.2: Hazardous Waste

In the HDCs to a large extent, and in the LDCs to much lesser extent, a significant proportion of industries and businesses generate a separate category of waste that is regulated as hazardous waste. This is because the material is flammable, corrosive, explosive, or toxic. (Swanson; 2006 )

For example Such hazardous waste amounts to about 270 million tons a year in the United States. Canada produces up to 9 million tons of waste classified as hazardous.

A total of only 50 companies are the source of 80 percent of all U.S. hazardous waste. The chemical industry is the main producer, followed by petroleum refiners and the metal-processing industry. A host of smaller businesses, such as photo labs, dry cleaners, service stations, and printers, also contribute to the hazardous waste stream. (Swanson; 2006 )

### 2-6.3.3: Other Types of Waste

In addition to hazardous waste, industries and businesses produce some lots of other waste materials as a result of doing business. Included in this category are such things as mining

wastes, by-products of drilling and pumping oil and natural gas, and industrial-process wastes, including debris from construction and demolition. Much of this waste is water—an estimated 97 percent in the case of industrial-process waste—that is cleaned up by business that produces it. The sludge that is left is taken to municipal landfills.

#### **2-6.4; *REGULATION OF WASTE MANAGEMENT***

In general governments in the LDCs, for various reasons, on average fail to have firm policies on Waste Management Control.

In contrast DCs and HDCs generally have in place robust mechanisms to monitor and regulate all forms waste. For example in the USA, the state governments are responsible for regulation of all wastes considered non hazardous, while the federal government by law must regulate all hazardous waste, by use of bodies such as Federal Environmental Protection Agency. (Swanson; 2006 ).

#### **2-6.5; *WASTE STORAGE***

Collection and removal of Solid Waste invariably occurs at a time other than which it is generated. Further, there exists multiple solid waste processes, from household/office to end-point (eg, landfill). This establishes storage as a very vital aspect of Waste Management. Whereas intermediate storage may involve garbage-bags, small bins and large bins, open enclosures, closed deposits or garbage chutes, ultimate storage usually is usually in the form of a landfill, which is the conventional end/disposal-point of solid waste. (Swanson; 2006 ).

#### **2-6.6; *WASTE COLLECTION***

Waste collection in HDCs is an intensively technological and efficient affair due to the availability of adequate transport facilities (specialized purpose built vehicles, etc) alongside proper funding.

In LDCs, collection is usually hampered by lack of adequate facilities, low or nil funding, as well as poorly planned neighbourhoods characterized by narrow streets and non-existence of common use grounds to site refuse receptacles. This notwithstanding, sensitive local authorities make do with assorted vehicles available, handcarts, wheelbarrows, etc.

## **2-6.7; WASTE DISPOSAL**

### **2-6.7.1: Sanitary Landfill**

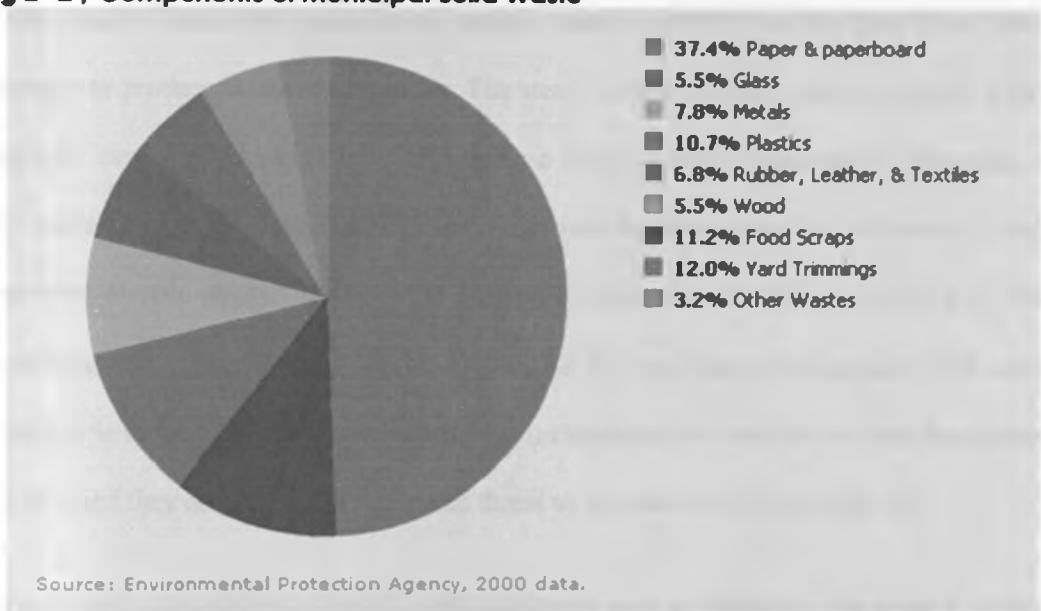
A sanitary landfill is a sunken dump site where earth is used in succeeding layers to cover compacted garbage, so as to prevent it from blowing away and keep down offensive smells (See Plate 2 - 8). This is the most common destination for ordinary solid waste. Experts classify it as the cheapest, safest, and least harmful method especially at the Municipal Level. (Swanson; 2006 ).

Objection to landfills revolve around the anticipated blown garbage, foul smells, rodent infestations, increased truck traffic in neighborhoods, and lowered property values. More significantly, from an environmental and public health standpoint, probably the most legitimate concerns about a landfill are its potential to pollute the underlying groundwater with leaking liquid, called *leachate* (S. Swanson, 2000). The fact that most of the world's population relies on groundwater as its source of drinking water, legitimises concerns about *leachate* contamination.

Currently, most regulatory authorities, especially in the HDCs, require landfills to have thick linings, usually made of several feet of impermeable clay and thick strips of plastic that have been heat-sealed together, to prevent fluids from escaping. Another common safeguard in modern landfills is a system of pipes to collect *leachate* within the landfill and carry it to a treatment facility. Other pipes can draw off the methane gas that rotting garbage gives off;

the methane can be purified and burned to create electricity. Some landfills also have monitoring wells outside the landfill that will allow the early detection of a leak. (Swanson; 2006 ).

**Fig 2- 2 ; Components of Municipal Solid Waste**



Source: Microsoft Encarta Reference Library 2004.

**Plate 2 – 7 ; A Landfill Operation in progress**



Source: Microsoft Encarta Reference Library 2004.

### 2-6.7.2: Incineration

Some municipalities have invested in incinerators partly as an alternative to landfills. These are special plants built to burn solid waste, which cumulative research has analysed as on average consisting of 25 to 60 % water and 15 to 50 % combustible materials. By products of incineration include carbon dioxide and other gases. (Swanson; 2006 ).

Most modern municipal incinerators, largely found in HDCs, use the heat from burning garbage to produce steam or electricity. The steam, which does not come in contact with the garbage, can be sold to local industries that use steam in their manufacturing processes, and the electricity, which is generated by turbines driven by steam from the incinerator, is fed to the local electric utility, reducing the utility's consumption of coal or natural gas. These beneficial uses of the energy stored in garbage are one reason incineration with energy recovery is favoured over the use of landfills. Incinerators also require less land than garbage dumps, and they do not pose the potential threat to groundwater that landfills do.

Opposition to incinerators abounds, just like in the case of landfills. This usually revolves around two issues: toxic air pollution and disposal of the ash that is left after garbage has been burned. (Swanson; 2006 ). Residents, who live near incinerators, are concerned about the health effects of breathing incinerator emissions. In the modern society, where scientists seem to find a new risk factor for cancer almost daily, incinerator opponents maintain that even minute amounts of such toxic emissions are a public health hazard. Further, incinerator ash, which represents 10 percent or more of the volume of the garbage before burning, is known to contain toxic metals. These metals, such as lead, mercury, and cadmium, do not burn in the raw garbage, so they become concentrated in the ash, which is dumped in landfills.



Finally, incinerators require specialized equipment, they are equipped with complicated mechanical systems, and they require more maintenance. Thus they tend to be more expensive than landfills.

### **2-6.7.3; Recycling/ Recovery/ Scavenging**

Frequent opposition from residents and environmentalists to landfills and incinerators, has strengthened the case for recycling. Recycling programs reduce the need for new landfills and incinerators because they cut the amount of garbage that requires disposal. Further, recycling conserves natural resources, such as plants and minerals, and saves energy. For instance, making a new aluminium can out of recycled aluminium require only 5 percent of the energy that is expended to refine aluminum from bauxite ore (S. Swanson, 2006). Thus recycling reflects the principle of sustainable development.

Universally, each household/office/plant regularly sorts its recyclables, (newspapers, glass bottles, aluminium cans, and so on) and places them in a plastic bins, which is put out for collection once a week. A truck with separate compartments for each type of recyclable takes the items to a processing site; there they are bundled for shipment to factories or mills, to be converted into new newsprint, bottles and cans, or other goods.

In HDCs, governments may impose a deposit on empty containers and cans. Bottling companies oppose deposits because they raise the price of their products and make the companies responsible for handling empty containers, an added expense. (Swanson; 2006).

Drawbacks to recycling include space, where for example in apartment buildings, kitchens may be too small to accommodate a recycling bin easily. Also studies indicate such programs have little success in low-income neighborhoods, where residents tend to be more worried about jobs and crime than the environment.

## **4-0 CHAPTER FOUR - THE STUDY AREA**

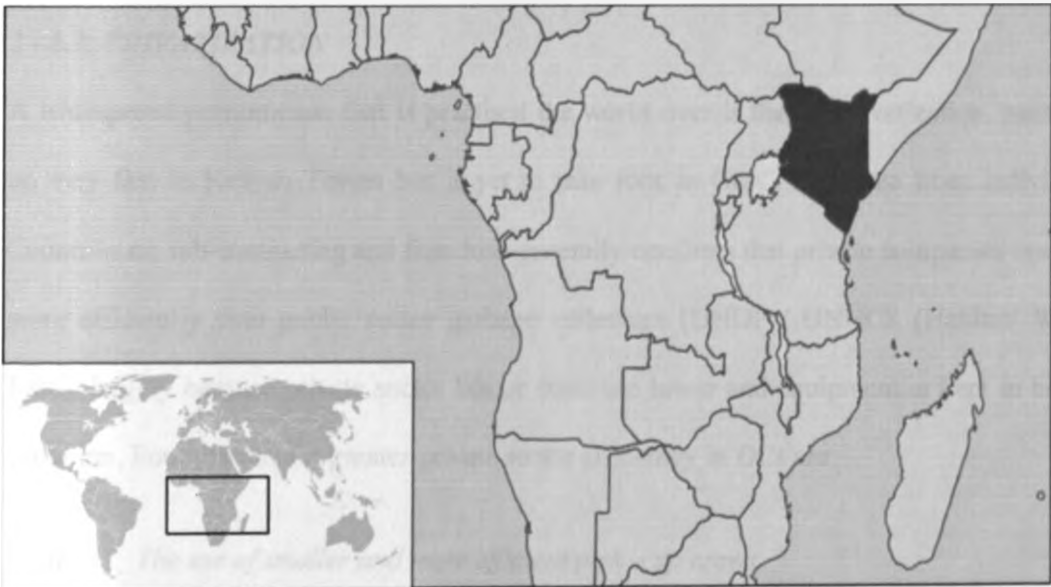
### **4-1; INTRODUCTION**

The main body of this study systematically examined the role of GMC with respect to waste management services. As a background to this examination, this chapter starts by covering the study area in detail.

### **4-2; GARISSA TOWN**

Garissa Town the provincial Headquarters of North Eastern Province and District Headquarters Garissa, is approximately 350 Km East of Nairobi(See Figs 4-1 & 4-2). The town is currently classified as a municipality. Word and Folklore has it that the town is named after a *Pokomo elder, Karisa* whose farming clan was one of the earliest settlers of the present day town.

**Fig 4 – 1: Kenya is a country In Tropical East Africa**



SOURCE ; WIKIPEDIA,2009

## **2 - 6.8; COMMUNITY PARTICIPATION**

A significant strategy to Solid Waste management the world over usually involves the active participation of the dwellers. Ochieng (2004) reckons that if well organised, community members in an area can play different vales in solid waste service delivery. They can participate in SWM by showing proper sanitation behaviour, by contribution in cash kind or labour by participating in consultation and by participating in administration & management of SWS.

For instance, in Lahore Pakistan, 40% of refuse is picked up by farmers for use as animal ,feed and soil amendment. (Kirov; 1982). In Cairo and Mexico City middlemen are common to system of scavenging. In Medellin, Colombia, according to Pinnock (1998), they purchase recycled materials from the land fill scavengers, and re-sell them for processing and re-use. Pinnock (1998) also reports refuse collectors in Bangkok, Thailand providing door to door service using large baskets and two wheeled dollies. At the curbside, before loading into the trucks the collectors pick through the refuse, recyclables are sorted and placed in baskets on top of each truck to be sold enroute to disposal facilities.

## **2 - 6.9; PRIVATIZATION**

A widespread phenomenon that is practised the world over is that of Privatization. catching up very fast in Kenyan Towns but is yet to take root in GMC. Evidence from individual Countries on sub-contracting and franchise generally confirms that private companies operate more efficiently than public sector garbage collectors (UNDP / UNHCS (Habitat/ WBK 1995), largely because private sector labour costs are lower and equipment is kept in better condition. Four reasons for greater private sector efficiency in DCs are;

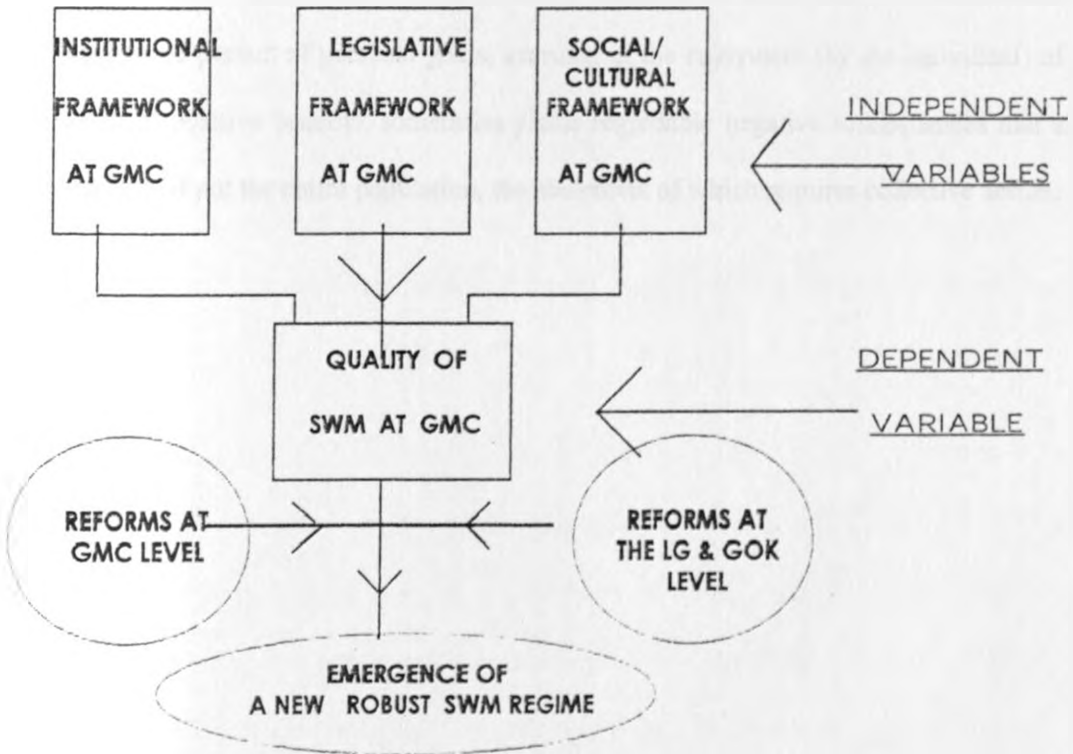
- i) *The use of smaller and more efficient pick – up crews*

- ii) *Less absenteeism among contractor work forces*
- iii) *Greater use of employee incentives to increase morale and productivity in more use standard vehicles, better maintained.*

However UNDP UNCHS / WBK (1995) reports that it is essential that urban administration is adequately organised to produce contract specifications to monitor activities of the private partners and to administer complaints received from the public ( As a broad guidelines it is estimated that monitoring costs can represent some 15% of the cost of the contract (Cointreau – Levine, 1994). UNDP (95) competition is the key to getting a low cost good quality solid waste service from private firms. Clearly this route is one of the ways the SW problem in GMC can be confronted.

**2- 7: CONCEPTUAL FRAMEWORK**

**Fig. 2-3; Conceptual Framework for Swm In Garissa**



(Source; Author's Construction,2009)

## 2 – 8: SUMMARY

The above literature review confirms strongly that effective Solid Waste approach is one vital way to ensure that the twin Millennium Goals Six (Combating Diseases), and Seven( Ensuring Environmental Sustainability) are on course to be attained. The literature review found that dirty living environments inevitably heralded disease and misery and consequently demoted productivity, an ironical reversal of the original aim of aggregating into urban centres.

The Brandt commission noted that expected industrial growth was foreshadowing rapid increase in population and resource degradation and urged decisive action (The Brandt Commission, 1987). Schumbeller (1996) warns that all must come to the realization that aggressive pursuit of personal goals, accruing in the enjoyment (by the individual) of a vast array of positive benefits, sometimes yields regrettable negative consequences that affect a majority if not the entire population, the abatement of which requires collective action.

## **3.0 CHAPTER THREE – RESEARCH METHODOLOGY**

### **3 - 1 INTRODUCTION**

Research is a diligent and critical inquiry of a given phenomenon in order to review inadequacies towards improving on the body of knowledge (Mugenda & Mugenda; 1999) This Chapter delves into the strategy, methods and execution of the process which was employed in conducting the said inquiry.

The methodology involving setting objectives and formulating hypothesis and assumptions as parameters to guide the study. Decisions on population and characteristics, sampling, field work and survey of existing disposal system in *Garissa* town were then made. Personal interviews were administered via well structured questionnaires and data systematically gathered from Government as well as other offices.

### **3-2 RESEARCH DESIGN**

This study designed a research model targeting residential dwellers in *Garissa* Municipality as well as government and other offices. A scattering of commercial institutions and even fewer industrial establishments existed but these were omitted as they fell outside the scope of study.

#### **3-2.1 Municipal Residents**

Research in residential areas centred specifically on inhabitants of *Garissa Dogo* Estate. This zone was selected as it represented a purely undifferentiated residential neighbourhood. This estate exhibited homogeneity in household size, and income levels judging by the levels of capital development on the individual plots. Also observed were

similar plot –and-street problem-specific characteristics as well as uniform levels of refuse heaps and putrefaction.

### **3-2.2 Government Officials**

For the official interviews the offices were chosen due to relevance to the solid waste question and these were:-

- *-The Municipal Council*
- *District Office of Central Bureau of statistics.*
- *District Environment / Agricultural Office*
- *Public Health Office*

The interview involved officials specifically nominated for the interviewer by the Garissa Municipal Council, including the Town Engineer, Works Office & Cash Office. The officials were largely co-operative indicative of the weight the Council attaches to the solid waste management problem. But the interviews were severely hampered by lack of proffered documented Data, and it was not easy to establish if it was a case of highly controlled access by bureaucracy, or one of virtual unavailability.

### **3-2.3 Timing of Interviews**

The interviews were scheduled to happen around residents 6 pm when people were back from work and after “*adhuhur*” prayers. For Govt officials however the interviews were conducted within working hours and on appointment.

### **3-2.4 Structure of Questions**

The interview mode was structured questionnaire as well open ended questions and discussions to allow residents room to generate improvement information Interviews were asked for names as sign of good faith.

3-2.4.1 Questionnaire 1: targeted the resident populations (domestic households only) and sought to hear the planning standards and success of SWM as well as residents attitudes.

3-2.4.2 Questionnaire 2: targeted Municipal Government Officials seeking to gauge the effectiveness of their services.

3-2.4.3 Questionnaire 3: targeted Garissa Municipal Council Records Section

3-2.4.4 Questionnaire 4: targeted Garissa Municipal Council Solid Waste Section

3-2.4.5 Questionnaire 5: targeted Garissa Municipal Council Accounts/ Finances Section

3-2.4.6 Questionnaire 6: targeted Kenya National Bureau Of Statistics, Garissa Office

3-2.4.7 Questionnaire 7: targeted Public Health Officials seeking to find out the relationship between solid waste and health of residents and possibly, the uniqueness of their results to *Garissa*.

### 3-3 DATA COLLECTION

#### 3-3.1 Primary Data

This was to provide first hand information on the study problem and was accomplished via the following:

- Questionnaires administered to several entities as seen previously
- Informal discussions
- Visual observations
- Photography to arrest the visual impressions of the prevailing conditions.

#### 3-3.2 Secondary Data

This was largely information gleaned from a variety of Libraries on strategic planning standards, existing policies legislation, solid waste management methods as of current, and private sector entry into SWM and its ramifications. Information on details of study area was also assembled. Apart from libraries, other secondary data was got from local



Authority offices, Health Offices, Government Development plans, magazines, newspapers and the Internet.

### **3-4 SAMPLING FRAME**

Since factories and large commercial trade outlets are non-existent in Garissa, the household was selected as the standard unit of SW data measurement.

#### **3-4.1 Sample Design**

Though a researcher should take as large a sample as possible (Mugenda Mugenda, 1999), limitations of time and resources dictated the careful selection of a small but representative sample of 120 households whose characteristics would be as truly similar to entire population as possible.

#### **3-4.2 Sampling Method**

The technique used was systematic random sampling (Mugenda Mugenda 1999).

The residences in the chosen zone were numbered in two digit numbers (01, 02, 03 ----) then randomization was conducted via a programmable calculation. The sample was obtained by picking every sixth (6<sup>th</sup>) household until the desired sample size (120) was attained. Where the house was vacant or locked or no respondent, the next individual on the list was interviewed. The first house nearest the Municipal Council Offices was picked as No. 1 .

#### **3-4.3 Sample Characteristics**

The sample was considered most appropriate as it appeared to have households with most uniform incomes, consumption patterns and out put of waste.

### 3-5 ENCUMBRANCES EXPERIENCED IN DATA COLLECTION

A study of this magnitude could not have failed to encounter some encumbrances. These were as follows;

- *Inadequate background literature in SWM*
- *Where such data existed. It was mostly un-updated and hence of limited accuracy.*
- *Lack of confidence by respondents from the resident population due to latent anxiety that the interview was related to the ongoing geo-political crisis in the & North Eastern Province as well as the Horn of Africa region as a whole.*
- *Failure to obtain clear concise information (Spoken and written) government offices respondents owing to classical bureaucratic attitude, as well as anxiety that the research was a cover up for the contemporary government craven integrity, assessment and efficiency monitoring against civil servants.*
- *Individual respondent weaknesses especially among government workers involving laziness failure to honour appointments impromptu absenteeism, and ' I am busy, try tomorrow' attitude whose ghost still haunts corridors of government service. poor response, lack of understanding, communication / language barriers, and withholding of information. In govt offices, understanding limited time with officials and poor altitude.*

### 3-6 ANALYTICAL FRAMEWORK

Data from the field is invariably in raw form, (Mugenda & Mugenda 1999). Hence it must be cleaned, coded, and analyzed. Since this study was largely concerned with gathering and analysing information systematically to derive some useful recommendations on solid waste SWM in Garissa the method of data analysis used was Qualitative Analysis.

Hence this research was classified as a composite qualitative / qualitative research which employed face to face interview technique using self administered interview schedule. It sought to give the residents of Garissa a forum to be heard on SWM issues affecting them

right to the doorstep which is one of the strongest attributes of roles of Qualitative Research (Mugenda & Mugenda 1999) It also sought to hear from 'the other side' which is a natural pre-requisite of ethical research.

### **3.7 PRESENTATION OF DATA**

This was achieved via graphic and visual tools such as tables, figures, charts, maps, flow diagrams and photographic images.

### **3.8 DATA INTERPRETATION**

Interpretation was done via cross-tabulation and cross referencing. In this way the nature of relationships between variables was established.

### **3.9 CASE STUDIES**

Case studies were examined with candidates being towns within and without Kenya's borders and respective levels of success or failure of SWM.

### **3.10 SUMMARY**

Mugenda & Mugenda (1999) asserts that Research is mainly geared towards discovery of new facts, as well as validation of existing facts, then interpretation and practical application. Esho (1997) adds that to develop the right framework for SWM, it is essential to know how wastes are generated services and reasons why they are not handled in a proper manner by the relevant players.

Fig 4 – 2: Garissa Town lies 350 km to the east of Nairobi



SOURCE ; WIKIPEDIA

**4-2.1; A tale of two cities**

Garissa represents a Juxtaposition of two worlds coexisting together as one; Modern shopping malls, Hotels, Banks in the CBD and its immediate environs contrast sharply with run down makeshift *Manyattas* or *herios* on the out skirts. The Juxtaposition of Rural Poverty and Urban affluence presents perhaps the biggest challenge to delivery of services, including SWM in the NEP Headquarters.

#### 4-3: LOCATION AND SIZE

Garissa District (See Fig 4-3) is one of the four districts of North Eastern Province. It borders Isiolo District to the northwest, Wajir to the north, Republic of Somalia to the East, Tana River District to the west and Ijara District to the south. The district is located between latitude 0o 58' north and 1o 30' south and longitudes 38o 34' east and 41o 05' west. The district covers an area of 33,620 square kilometers and is administratively divided into 11 divisions, 42 locations and 60 sub-locations. The district has three constituencies, namely Dujis, Lagdera and Fafi. The constituencies are vast and sparsely populated. The District is approximately 50,000 sq KM and lies in a region which is not geologically mapped. The district has four (4) divisions; Central, *Sankuri*, *Danyere* and *Mbalabala* with Garissa town being in the Central Division.

Garissa is the capital of both the province and Garissa District. Garissa is located near 0°27'25" S 39°39'30" E / 0.45694°S 39.65833°E, and lies at an altitude of 492 metres above sea level. Lying some 350 km North-East of Nairobi, Garissa is a focal point of major and minor roads leading to various centres such as *Wajir* (346km North), *Mandera* (770km North East), *Ijara* ( 150km South East) *Hola* (50Km South and *Mado Gashi* or *Modogashe* ( 130km to the East).

Garissa forms a municipality (See Fig 4-4) that has six wards (Biashara, Bulla, Jamhuri, Market, Mashambani and Stadium). All of them belong to Dujis Constituency, which has a total of thirteen wards. The remaining seven are located within Garissa County Council, the rural council of Garissa District. It lies near the lower North Eastern tip of Kenya and it is sited on the Northern Bank of River Tana and roughly at the confluence of the borders of the Eastern, North Eastern and Coast Provinces.





**Fig 4 - 4; Map of Garissa Municipality Showing Main Residential Zones:**  
 Source; District Statistics Bureau, 2009

The town is widely regarded to as the “The Gateway” to and From the NEP, the Greater Somali and the Horn of Africa. It is not only the administrative centre for the province but is also the commercial hub for the province(See Plates 4-1 & 4-2) and supplies even other towns outside the province like Bura and Hola. It also has a Provincial General Hospital, a referral hospital serving the surrounding the entire province and the nearby *Mwingi and Tana River Districts*.

A major tourist attraction is the mighty *Tana River* which flows through the city of Garissa as it courses to the Indian Ocean (See Fig 4-1).

#### **4- 4: TOPOGRAPHY**

Geologically the district is mainly dominated by Triassic to recent sedimentary deposits that include conglomerates, alluvial sands, quartz, pebbles, clayey sands and clay deposits. There is high presence of Gypsum, Gemstones which are yet to be discovered and evaluated for their economic viability.

#### **Box 4 – 1; Anatomy of Tana River**

The 440-mile **Tana River** is the longest river in Kenya, and gives its name to the Tana River District. Its tributaries include the Chania and Mathioya. The river rises in the Aberdare Mountains to the west of Nyeri. Initially it runs east before turning south round the massif of Mount Kenya. The river then turns into the Masinga Reservoir and the Kiambere Reservoir created by the Kindaruma dam. Below the dams the river turns north and flows the north-south boundary between the Meru and North Kitui and Bisanadi, Kora and Rabole National Reserves. In the reserves the river turns east, and then south east. It passes through the towns of Garissa, Hola and Garsen before entering the Indian Ocean at Ungwana Bay.

*SOURCE ; Kenya Govt; Ministry of Env. & Natural Resources,2009*



**Plate 4 – 1; A Major View of Garissa showing part of the CBD**



*Source: Author, Field Survey, 2009*

**Plate 4 – 2; The Main Public Park in Garissa showing a National Monument.**



*Source: Author, Field Survey, 2009*

The district is generally arid. The soils range from the sandstone, dark clays in some patches, to alluvial soils along the River *Tana* basin. The soils can be classified into alluvial, white and red sand soils. The white and red sand soils are found in *Balambala* Division where the terrain is relatively uneven and well drained. The soils hold no water but support vegetation which remains green long after the rains. These soils have potential for farming. The rest of the district has sandy soils that support scattered shrubs and grassland. The alluvial soils occur along the riverine of *Tana* River and along the *lagha* valleys. The soils are very fertile and can support increased agricultural and livestock production using irrigation.

The district lies between 70 to 400 meters above the sea level and has no spectacular mountains or hills save for small Hummocky sandy dunes normally characterised by the occurrence of dry river valley beds locally known to as *Lagga(s)*. There is no permanent river apart from the famous **River Tana** which is 3 kms from the border of the district and *Tana* River District.

#### **4 - 5 : PHYSIOGRAPHY**

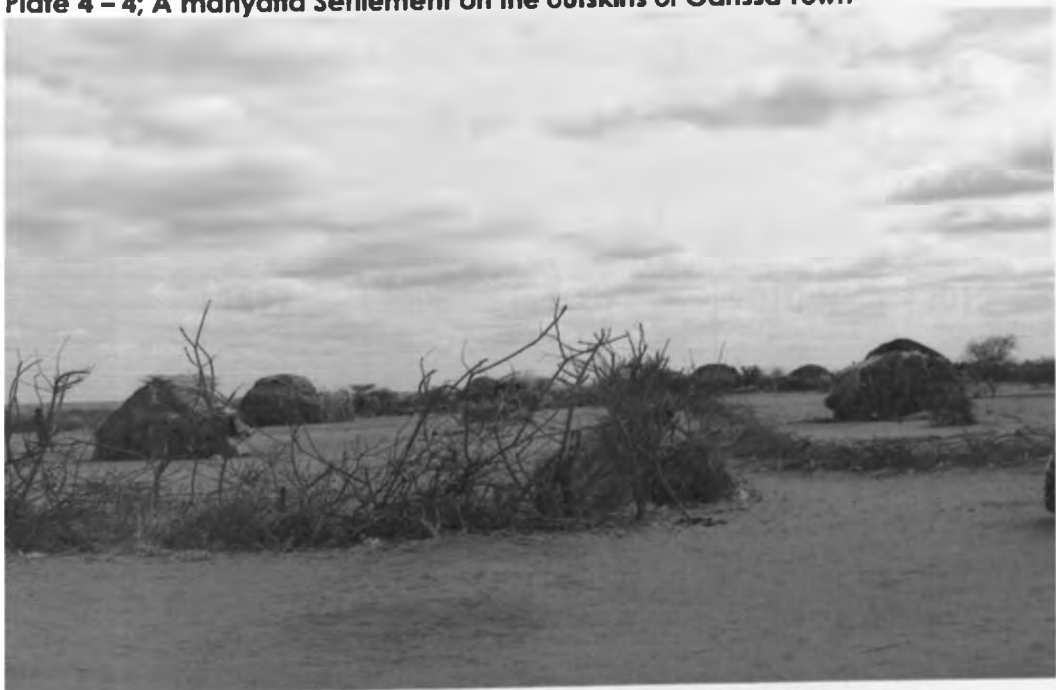
The climate is generally hot and dry throughout the year with temperatures ranging from 20 °C to 38 °C and has two unreliable rainy seasons with long rains from March to April and the short rains from October to December. Average rain ranges between 20 and 34 mm. The Town enjoys lots of sunshine; about 9.5 per day. Strong winds from April to August can be utilized to produce electricity and / or windmills (Kenya Government; (2002), National Development Plan for Garissa 2002 – 2008)

**Plate 4 – 3; A typical Somali Manyatta- Herio**



*Source: Author, Field Survey, 2009*

**Plate 4 – 4; A manyatta Settlement on the outskirts of Garissa Town**



*Source: Author, Field Survey, 2009*

Vegetation is generally short shrubs, the indigenous Acacia trees, cactus, elephant grass and now the *Prosopis Julliflora* commonly known as the *Mathenge*.

#### 4 – 6 ; DEMOGRAPHIC TRENDS

Since elevation to municipal status in Garisa has one of the highest population growth rates in Kenya. This coupled with refugees and unplanned extensions of the municipality’s area, have led to unbelievable increase in SW generation.

##### 4-6.1: Social Trends

Most of the inhabitants of Garissa are ethnic Somalis who are pastoralists. The major clans in the region belong to the *Ogaden* sub-clan of the Somali *Darod*. There are also a small number of other minority tribes commonly referred to as corner tribes.

Rural urban migration is very evident with its catchments areas being the whole of North Eastern Province and the neighbouring *Mwingi* and *Tana River Districts* with the most of the blue Collar Jobs being done by the latter immigrants.

Table 4 - 1: Population Projection for Garissa District , 2008 and 2012

Year \ Gender	1999	2008	2009	2010	2012
Male	54,772	72,254	73,171	73,898	75,375
Female	49,455	65,239	66,067	66,724	68,058
<b>Total</b>	<b>104,227</b>	<b>137,493</b>	<b>139,238</b>	<b>140,622</b>	<b>143,433</b>

Source: CBS Garissa, 2009

**Plate 4 – 5; Camel Rearing; the prestige of Garissa District and NEP In General**



*Source: Author, Field Survey, 2009*

**Plate 4 – 6 ; Goat Keeping; the main Economic Mainstay of Garissa and NEP In General**



*Source: Author, Field Survey, 2009*

#### **4-6.2: Population Trends**

The Population of the district is around 139,238 according to KNBS projections and the municipality is 94,571 (See Tables 4-1, 4-2 & 4-3). However there is a very large refugee population from the neighbouring Somali republic which has not been included in the projections.

**Table 4 - 2: Population Projections for urban areas 2008 and 2012**

Urban centres	1999			2008			2010			2012		
	Male	F/male	Total	Male	F/male	Total	Male	F/male	Total	Male	F/male	Total
Town Garissa	36,340	32,863	69,203	47,939	43,352	91,290	49,030	44,338	93,368	50,010	45,224	95,234

Source: CBS Garissa, 2009

The District population density is 24.2 people per square kilometre on average. Central division hosts the District and Provincial Headquarters and is the smallest in size. It has the highest population with a density of 108.8 Persons/km<sup>2</sup> while Sankuri The Division has the lowest density at 8.5 Persons/km<sup>2</sup>.

**Table 4 - 3: Population Distribution and Density by Administrative Division**

Division	1999		2008		2010		2012	
	Population	Density (km <sup>2</sup> )	Population	Density (km <sup>2</sup> )	Population	Density (km <sup>2</sup> )	Population	Density (km <sup>2</sup> )
CENTRAL	70,791	82.4	93,385	108.7	95,511	111.2	100,354	116.8
SANKURI	11,713	6.4	15,451	8.5	15,803	8.7	16,604	9.1
MBALABALA	13,071	6.8	17,243	9.07	17,635	9.2	18,530	9.7
DANYERE	8,652	7.7	11,413	10.18	11,673	10.4	12,265	10.9

Source: CBS Garissa, 2009

#### **4-7 ECONOMIC TRENDS**

The Local People are largely Livestock keepers (See Plates 4-3 & 4-4). Another major activity is trading, and to a minor extent, the practise farming along the River *Tana*. However, overall, 67% of the population in the district is living below poverty line (See Table 4-4). 55% of the population within the Municipality is living below the poverty line. Literacy level is very low and the illiterate have not been spared by poverty with 65% living below poverty line as compared to 30% of the people with secondary education and above.

**Plate 4 -7 ; Residents Keeping Animals along Kismayu Road**



Source: Author, Field Survey, 2009

The economic situation is so dire even in urban areas that though Municipal Regulations officially expressly forbid keeping of animals, the municipal residents tacitly do so under the guise of livestock trading, with authorities turning a blind eye (See Plate 4-7).

**Table 4 -4 : Poverty Incidence In Garissa and Outlying Areas**

BY DIVISIONS	PERCENTAGE	WITHIN GARISSA AND ENVIRONMENTS	PERCENTAGE
GARISSA	64%	Central Division	51%
MBALAMBALA	67%	Township	65%
DANYERE	64%	Iftin	59%
BENANE	64%	Waberi	59%
		Bour – Algi	61%
		Kora kora	63%
<b>OVERALL URBAN POVERTY IN GARISSA 55%</b>			

Source: CBS Garissa, 2009

#### **4 - 8; SECURITY TRENDS & IMPACT ON POPULATION**

Records in the National Library, Garissa Office indicate that in the 1960s, a secessionist uprising led by an extremist militant grouping among the local indigenous population was waged against the Kenya Government. Later in the 1970s and 1980s, a mysterious wave of banditry, animal theft and sporadic killings overtook the NEP. Both events predictably brought misery, untold suffering, and acute underdevelopment.

A significant aspect to note today is the tremendous decline of banditry and insecurity to zero which in the 1990s has led to an increase in investors and donor confidence, and hence a further increase in population.

#### **4-9; INFRASTRUCTURE GENERALLY**

Infrastructure standard in Garissa in NEP are unbelievably appalling. For example there is only 3 km of tarmac road in the whole of the NEP, 10km of which was constructed last year. Only the three major towns of *Garissa*, *Mundera*, *Wajir* and *Habasweini* have electricity power supply and, rather than tap the more reliable national grid, the power is inadequately provided by means of diesel powered generators which suffer frequent breakdowns. Only *Garissa* town has a sewage system and the other towns have to contend with traditional toilets. In the special case of *Wajir* town, where the water table is very near the surface, a mandatory manual bucket system has been imposed in place, dating from colonial days.

With major infrastructure items such as roads, power and health provision being major concerns of any town, and yet being poorly provided for in NEP and Garissa in particular, it can then be deduced why Solid Waste is relegated downwards in prioritization.



## **5.0 CHAPTER FIVE – DESCRIPTION, ANALYSIS & SUMMARY OF MAJOR FINDINGS OF SOLID WASTE MANAGEMENT IN GARISSA:**

### **5-1 INTRODUCTION**

This Chapter tackles in detail the general research findings of the Study carried out in Garissa, with a view to generating implications and recommendations. Urban growth theory tends to assume adequate facilities and services, but in most societies, local authorities are increasingly unable to keep pace with the rapid and unregulated urban population growth. One of the most visible signs of this failure appears in the collection and disposal of solid wastes and nowhere does this reality ring true as vividly as in Garissa Municipality.

### **5 – 2: CHALLENGES LIMITING SUSTAINABLE DOMESTIC SOLID WASTE MANAGEMENT IN THE RESIDENTIAL AREAS OF GARISSA MUNICIPALITY**

In Garissa Solid waste management started during the colonial times when the colonialist used to force residents to clean-up on specific days of the month. Chiefs would mobilize the residents for the exercise. Upon getting independence the Local Council took over the management of solid waste. According to a senior official from the municipal council of Garissa, there is no clear, locally developed policy on sanitation and refuse management. The Council has also been also overwhelmed by the rapid population growth in the town due to, as seen earlier in Chapter 4, its growth and the influx of refugees from the war torn Greater Somalia.

#### **5 – 2.1: CHALLENGE OF HIGH LEVELS OF WASTE GENERALLY**

##### **Composition of Waste**

The research found that in Garissa Municipality most of the solid waste is generated by Commercial and Industrial Sector and also by Residential Areas.

The classification of waste handled by the Municipal Council of Garissa is as follows: -

- i. *Domestic Waste*
- ii. *Eating Houses Waste*
- iii. *Construction Waste*
- iv. *Hazardous Waste ( Chiefly From the Health Institutions)*
- v. *Commercial Waste*
- vi. *Animals Carcasses*

**Amounts of Waste**

The Garissa Municipality reported on overall waste generation as follows:

**Table 5 – 1; Waste Generation in Garissa in the Past four Financial Years**

Type of Waste	Amounts (tonnes) F/Y 05/06	Amounts (tonnes) F/Y 06/07	Amounts (tonnes) F/Y 07/08	Amounts (tonnes) F/Y 08/09
Domestic	458	540	650	720
Eating House	830	985	1250	1440
Construction	85	180	290	360
Hazardous	190	203	286	385
Commercial	3580	4062	4930	5400
Carcasses	42	58	65	72

Source: GMC, 2009

Clearly from Table 5-1, it can be observed that waste handled by the Municipal Council of Garissa has been on a relentless increase annually.

**5 – 2 .2: CHALLENGE OF HIGH LEVELS OF DOMESTIC WASTE WITHIN GARISSA MUNICIPALITY**

The research also found a high level of Domestic/Household Waste in Garissa Municipality. Most of the solid waste generated by residential households is composed of vegetable materials and natural detritus (See Fig 5-1)..

After analysis of the Data, it was deduced that Per Capital Solid Waste Generation Rate for Garissa was on average 0.84kg per person. This PCSWGR (Per Capital Solid Waste

Generation Rate), when compared to similar studies conducted in several urban areas of Africa and Asian countries by UNCHS (1986), which study areas included Port Novo(Benin) 0.5kg, Ouagadougou (Burkina Faso) 0.7kg, Cairo (Egypt) 0.5kg, Accra (Ghana) 0.4kg, Bangui (Gambia ) 0.3kg, Kampala (Uganda) 0.6kg, Lagos (Nigeria) 0.5kg, Calcutta (India) 0.5kg, Lahore (Pakistan) 0.6kg, and (Nairobi) Kenya 0.6kg, indicates a high rate of waste production in Garissa Municipality even after mathematical adjustments to cater for population increase since the study was done.

Other significant materials strewn around dumpsites, drains and streets in the town (See Plate 5-1 and Plate 5-2) include plastic-based paper bags, bottles and other containers. The lowest amount is in rare items such as rubber.

**Plate 5 -1 ; Primary School at Bulla Sheikh Near KenGen Plant chocking in garbage**



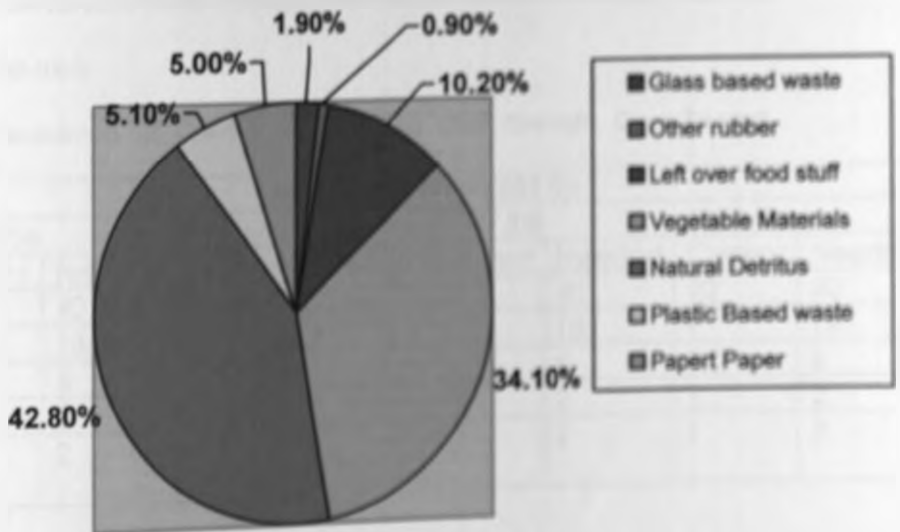
*Source: Author, Field Survey, 2009*

**Plate 5 - 2: The Non-bio degradable waste choking a street near Kengen Plant; note vehicular movement is inevitably reduced to nil**



Source: Author, Field Survey, 2009

**Fig 5 - 1; Pie chart showing Composition of Domestic Waste in Garissa.**



Source: Author, Field Survey, 2009

**5-2 .3 ; HIGH LEVELS OF THE MATHENGE WEED 'PROSOPIS JUNIFLORA'**

There is on average a rather high prevalence of natural organic waste. The high amount in natural detritus and can be attributed to the high prevalence of the invasive *Mathenge* Plant.

The invasion of the prolific thorny weed '*prosopis juniflora*' otherwise commonly known as '*MATHENGE*', that is ubiquitous in arid climates including NEP poses a continued hazard to the environment, building constructions, roads building, and monitoring sectors as well as health impact due to its thorns and toxic sap. It is however, largely ignored to grow wild by the residents who clearly have no control capacity, and more significant ignored by the Municipal Authorities despite its immense potential as a source of food & fuel.

**5- 3 : SPECIFIC INSTITUTIONAL CHALLENGES OF GARISSA MUNICIPAL COUNCIL**

**5- 3 .1: CHALLENGES OF LOW STAFFING LEVELS**

The research found council has engaged only 40 casuals and 15 permanent members of staff to clean and collect solid waste from the streets and the storm water drains which are usually choked with trash.

**Table 5 - 2; Breakdown Of Current And Desired Staff Strength Over Recent Financial Years**

F/Y STAFF	NUMBER OF WORKERS IN:							
	FY 05/06		FY 06/07		FY 07/08		FY08/09	
	Current	Needed	Current	Needed	Current	Needed	Current	Needed
Sweepers	20	40	20	40	20	40	20	40
Loaders	9	18	9	18	9	18	9	18
Drivers	3	6	3	6	3	6	3	6
Overseers	1	2	1	2	1	2	1	2
Head of department	1	2	1	2	1	2	1	2

Source: GMC, 2009

There thus exists grossly inadequate Staffing Levels (See Table 5-2). It was found that the same staff is deployed uniformly to all waste specific tasks from emptying trash bins, receptacles and the refuse chambers to movement of waste to final disposal.

**Table 5 – 3; Staff Strength Over The Last Four Financial Years**

YEAR STAFF	STAFFING STRENGTH			
	FY 05/06	FY 06/07	FY 07/08	FY08/09
Sweepers	20	20	20	20
Loaders	9	9	9	9
Drivers	3	3	3	3
Overseers	1	1	1	1
Head department	1	1	1	1

Source: GMC, 2009

Table 5-3 demonstrates a perennially tremendous strain on the Solid Waste Management Service over the recent past.

**Additional Shortcomings within GMC**

Additional individual-specific weaknesses especially among government workers were observed during interviews, ranging, for instance from laziness, impromptu absenteeism, failure to honour appointments, limited time, and a generally lucklustre attitude which is synonymous with a classical bureaucratic attitude to work that attends public offices in general.

Technical limitations were seen in poor response, lack of understanding, communication/language barriers, and poorly structured information flow. However this may improve with time following the government driven programmes recently installed on integrity assessment, performance contracting, and efficiency monitoring for the civil service.

### 5-3 .2; CHALLENGES OF LOCAL LEGISLATION

As happens with most Legislative/Regulatory Frameworks in Cities in the South, the Garissa Council's by-laws are not very specific on SWM issues. Additionally, they are neither clear on enforcement, nor action-lines / reporting-lines.

### 5-4 : SPECIFIC CAPACITY CHALLENGES OF GARISSA MUNICIPAL COUNCIL

#### 5-4.1 : CHALLENGES IN FINANCIAL ASPECTS

##### Revenue Allocation from Central Government

Usually the GMC gets funding from the government but it is the one tasked with drawing up the budget for utilization of the funds.

Table 5-4 ; Budgetary Allocations to Garissa Municipal Council

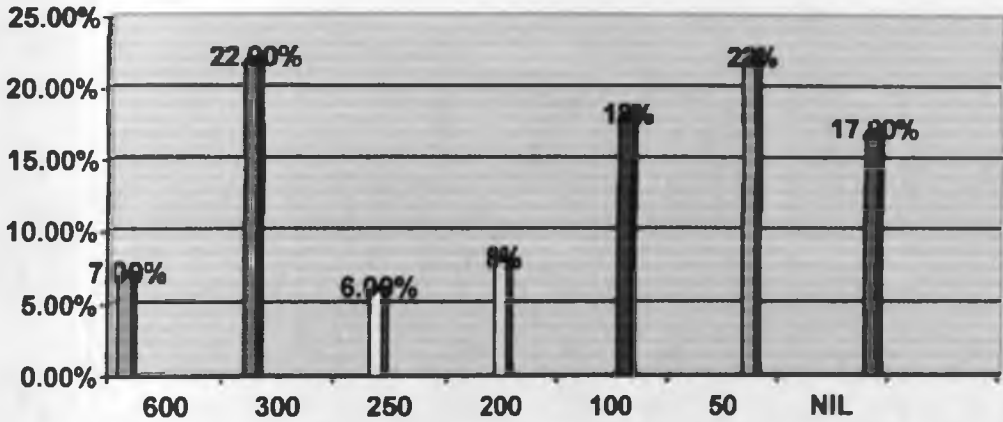
	<b>GOK Funding</b>	<b>Solid Waste Component (Ksh)</b>	<b>Funding from OtherSources</b>	<b>Revenue from Solid Waste(Kshs.)</b>	<b>Totals (Kshs)</b>
FY 2005/06		3,000,000	Data not available	Data not available	3,000,000
FY 2006/07		500,000	Data not available	Data not Available	500,000
FY 2007/08		500,000	Data not available	Data Not available	500,000
FY 2008/09		1,500,000	Data not available	1,250,000	2,750,000

Source: GMC, 2009

Thus the Funds available to the GMC from Central Government for SW functions was reported as grossly inadequate. (See Plate 5-4)

**Revenue Collection from Solid Waste Sector**

**Table 5 –5; Bar chart depicting varied Levies by the GMC as reported by the Residents**



AVERAGE LEVY = KSH 214 . 30 PER MONTH

Source: Author, Field Survey, 2009

Table 5-5 shows that for unclear reasons, the residents posted charges levied by GMC in varying amounts. The responses ended up incompetent enough to clarify if the charges were specifically a Solid Waste Levy, or a general Levy.

The council reported as charging residents and commercial entities including hotels Kshs. 500 per year for garbage collection. For example In the financial year 2008-2009 the council raised Kshs. 1,250,000 from garbage collection.

Thus the Solid Waste Management problem in Garissa is further traced to low Finances and prioritization. It is clearly apparent that one of the problems facing the Municipality is lack of adequate financial resources necessary to conduct robust solid waste management services.

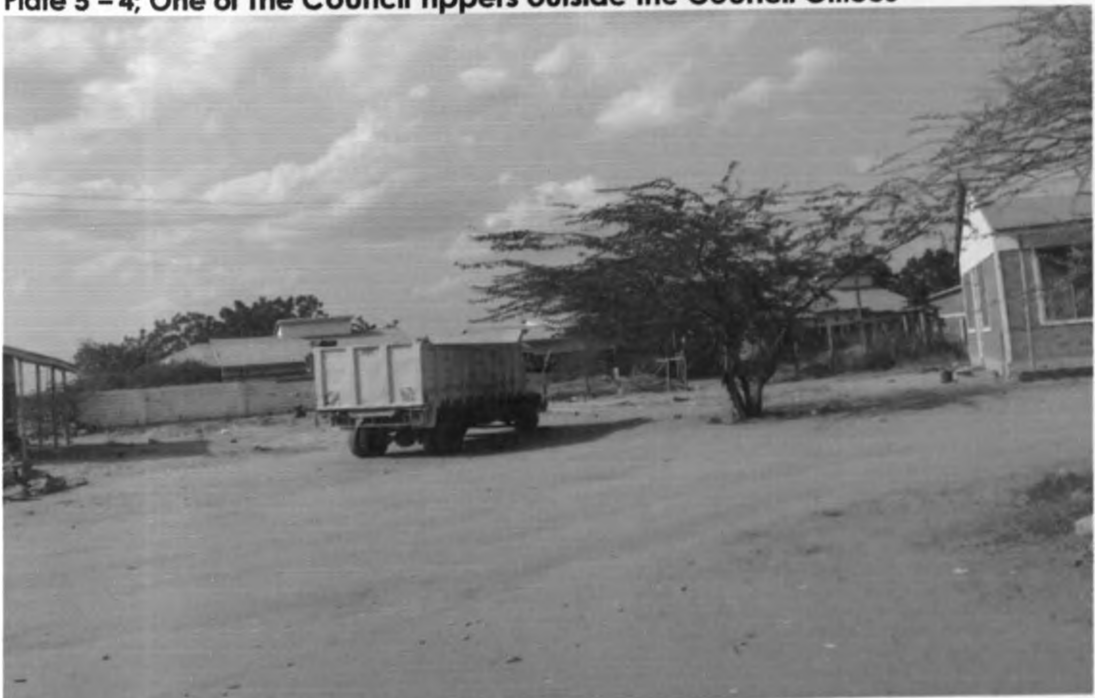


**Plate 5 – 3; The Municipal Trailer-Tractor used by the Municipal Council to transport garbage**



*Source: Author, Field Survey, 2009*

**Plate 5 – 4; One of The Council Tippers outside the Council Offices**



*Source: Author, Field Survey, 2009*

**Plate 5-5 : An overwhelmed Refuse Chamber next to Catholic Church, Garissa**



*Source: Author, Field Survey, 2009*

**Plate 5 -6 ; Decrepit Roadside Refuse bins; Appalling Infrastructure Standards**



*Source: Author, Field Survey, 2009*

Even though both the GMC and the residents reported varying amounts of charges and levies, the financial evaluation by this study indicated that whichever the true figures, if any, the total Funding available to the GMC for SW functions was dismally low.

#### 5 - 4.2 : CHALLENGES IN EQUIPMENT & INFRASTRUCTURE

##### Collection & Transport Methods

There is a severe in adequate collection and refuse transport machinery (Plates 5-3 & 5-4). GMC workers empty the trash bins, receptacles and the refuse chambers, using a limited supply of forks, rakes, brooms, shovels and wheelbarrows and loaded to the trucks with shovels or sometimes bare sacks. This is allegedly done daily, and the wastes are transported using only two open tippers and a trailer-tractor.

Table 5 -6; Current and required Waste Management Equipment Levels

EQUIPMENT	REQ-UIRED	AVAI-LABLE	CONDITIONS OF EQUIPMENT (TICK ONE)				
			UN SERVICE-ABLE	FAIR	AVER-AGE	GOOD	BRAND NEW
Brooms	25	5	4	1	-	-	-
Shovels	20	8	4	3	1	-	-
Wheelbarrows	15	2	1	1	-	-	-
Protection Gear (per person)	100	nil	-	-	-	-	-
Pactainers	5	nil	-	-	-	-	-
Multilifts	2	nil	-	-	-	-	-
Compators	1	nil	-	-	-	-	-
Minimatics	2	nil	-	-	-	-	-
Tipppers	2	2	1	1	-	-	-
Covered refuse motor - vehicles	4	nil	-	-	-	-	-
Trailer - tractors	6	1	nil	nil	1	-	-
Forks	20	6	3	3	-	-	-
Rakes	150	45	23	19	3	-	-

Source: GMC, 2009

Thus there exists very inadequate Waste Equipment Management Levels.

**Table 5 – 7; Distribution Of, and required Steel And Masonry Constructed Garbage Receptacles**

Item	Name of Street Junction of street	Type / Model of container	Size (Cubic metres)	How many	How many more needed
1	Kismay	3 Trash bin	204	3	10
2	Miraa	3 Trash bin	204	2	6
3	Kenyatta	3 Trash bin	204	3	6
4	Harambee	3 Trash bin	204	2	5
5	Lamu	3 Trash bin	204	Nil	10
6	Ngamia	3 Trash bin	204	2	6
7	Gsa Ndogo	3 Trash bin	204	1	3
8	Wajir	3 Trash bin	204	1	3
9	Shune	3 Trash bin	204	Nil	2
10	Kilimanjaro	3 Trash bin	204		

Source: GMC, 2009

There also exists an inadequate distribution of Steel And Masonry Constructed Garbage Receptacles.

#### **Storage Methods**

The council reported to having built ten (10) refuse storage chambers and 52 trash bins strategically placed along the streets in the CBD and residential areas. However a walk around the study area and a subsequent interview of residents painted a gloomier picture:

**Table 5 – 8 ; Breakdown Of Residents Access To Bins**

ITEM	MODE OF ACCESS	PERCENT ACCESS
1.	Access to Public Bins	11.0%
2.	Own Bin	81.2%
3.	Plastic Bags (Self-owned)	7.8%
4.	Other	0.0%

Source: Author, Field Survey, 2009

There is an acute shortage of well positioned bins (See Plates 5-5 & 5-6) accessible residents. the few residents who positively reported to having access to a bin also reported it as being half kilometer away.

**Plate 5 – 7; The disposal landfill comprises a sprawling a radius of upto one square km of ground-surface uncontrolled refuse dump**



*Source: Author, Field Survey, 2009*

**Plate 5 – 8; The uncompacted waste is inevitably blown by winds to span an area of up to ten kilometre radius, ringing the landfill**



*Source: Author, Field Survey, 2009*

Further, the few bins are open-air exposing them to misuse, under-use and rendering them as potential hazards to the environment. A significant number is in a state of disrepair.

### **Disposal Methods**

The waste collected from the storage places within the town and the other one cleaned from the streets and storm water drains is transported to the Councils designated landfill which is around five (5 no) Kilometers from the CBD along *Kismayu* Road towards *Wajir*. (Plate 5- 7 & Plate 5-8 )

### **5 – 5 : SPECIFIC OPERATIONAL CHALLENGES OF GARISSA MUNICIPAL COUNCIL**

Operational methods are simple and rudimentary. Members of staff empty the trash bins, receptacles and the refuse chambers. This is allegedly done daily. Due to the shortage in adequate manpower seen above, it was learnt that the same staff pool is uniformly deployed to sweep entire town, empty the trash bins, receptacles and the refuse chambers, load the waste transport it to the transfer stations, and again unload.

Plates 5-2 shows a dearth in adequate refuse. and the wastes are transported using only two open tippers and a trailer tractor. The waste is gathered together using forks, rakes, brooms, shovels and wheelbarrows and loaded to the trucks with shovels or sometimes in sacks. The Council thus lacks modern waste handling equipment like closed garbage-trucks, compactors and excavators, and even lack basic tools like brooms and shovels.

The waste is randomly cleaned from the streets and storm water drains. More waste is collected from the decrepit storage places within the town and then transported to the

Council's landfill. Again due to the shortage in adequate manpower, Equipment, and transport machinery, this collection was confirmed to be largely intermittent. (Though the Council officials painted a rosy picture, informal interviews with residents suggested this to be the case).

An additional misfortune is the GMC's failure to manage their dumpsites well enough. The only official land-fill in the town is, first of all, not marked, fenced, excavated, compacted, or otherwise regularly attended. The trucks from the Council usually offload their waste several hundred metres from the landfill making the entire place of one km radius terribly awful.

## **5 - 6 : OTHER GENERAL CHALLENGES CONFRONTING THE GARISSA MUNICIPAL COUNCIL IN ITS CURRENT ROLE OF IN PROVISION OF SWM SERVICES**

### ***5 – 6.1: HAZARDS AND ENVIRONMENTAL EFFECTS***

The Public health department reported presence of hazardous waste mostly from the hospitals- expired drugs, used syringes and needles which if not well disposed of, and could be dangerous to the general population and be responsible both for endemics such as HIV /AIDS and epidemics such as cholera, dysentery, Typhoid.

There is high prevalence in malaria as water tends to collect in the plastic bags and containers thus becoming the breeding grounds for the mosquitoes. We also have high prevalence in respiratory track infections due to burning and incarceration of the waste. There is also blockage of the drainage system due to the plastics and other waste which is not bio-degradable.

**5 – 6 .2: LITTLE INTERACTION WITH, & AWARENESS CREATION AMONG RESIDENTS**

Additional shortcomings were also found in the GMC 's failure in its obligation to educate the residents in critical spheres of on the Solid Waste Management. The Council is yet to engage the residents (See Table 5-9) especially by enforcing responsible dumping leaving the people to dump anyhow, and thus making the process of cleaning the town very tedious and expensive whilst the annual levies for the exercise is very minimal.

**Table 5 –9; Residents Preference on Visits By Municipal Officials**

ITEM	MODE OF FREQUENCY DESIRED	PERCENT DESIRING
1.	Weekly	70.0%
2.	Twice Weekly	5.0%
3.	Monthly	20.0%
4.	No visits necessary	5.0%

Source: Author, Field Survey, 2009

None of the residents reported being visited in the past. Indeed some claimed, though incredibly so, to having never seen a single official in their lifetime.

**Table 5 –10; Reasons For Such Desired Visits By Municipal Officials**

ITEM	REASON	PERCENT DESIRING
1.	Overwhelmed by Solid Waste	65.0%
2.	For Discussions/ Interactions on SWM	20.0%
3.	To return SWM to rightful bodies, and reduce our workload so we focus on other Tasks of Nation-building.	10.0%
4.	No visit necessary	5.0%

Source: Author, Field Survey, 2009



Such is the level of disillusionment and cynicism, that at least five percent of that the respondents feel self – sufficient enough not to need any input or visitations by local authorities. (See Table 5-10).

The GMC has also failed to commercialise Solid Waste Management which would have created employment to some of the unemployed in the town and ease the burden of waste management to the council.

### 5 – 6.3: PASSIVE ATTITUDE OF RESIDENTS

The town dwellers on their part indicated an unconcealed disinterest in active participation in SW matters be it refuse self-discipline or regular voluntary clean-up exercises.

Additionally, individual residences tend to treat the waste at their own discretion, and none of the residents reported to undertaking any processing of solid waste (Table 5-11 ).

**Table 5 – 11; Processing of Refuse Disposal System By Residents**

ITEM	METHOD	PERCENT PREFERENCE
1.	Left-over foods and other Wet waste is fed to animals and the rest gathered together to dispose	70.0%
2.	Separate & burn at different times	5.0%
3.	Undertaking no form of processing whatsoever	25.0%

Source: Author, Field Survey, 2009

Table 5-12 & Fig 5-2 shows majority of residents lack, and at interviews often cited, lack of an enabling environment for failure to control refuse sprawl in neighborhoods. Thus any empty space in the town is a virtual dumpsite.

**Table 5 – 12; Preferred Refuse Disposal System By Residents**

ITEM	PREFERRED SYSTEM	PERCENT OF RESPONDENTS
1.	Into a laga (dray stream bed)	5.0%
2.	Accumulation of waste in a sack for a week and then disposal far from doorsteps (50 to 100m away)	65.0%
3.	Accumulation then throw out 0.5km away	15.0%
4.	Deliver to Municipal Council every three days	5.0%
5.	Retain Incinerate & Burn within residence (except animal feed)	10.0%
6.	Private Collection	0.0%

Source: Author, Field Survey, 2009

Additionally, a significant proportion of those interviewed curiously cited a general cultural disdain for waste products, but this excuse could not be scientifically confirmed.

**Fig 5 – 2; Reasons for Refuse Disposal Preferences By Residents**



- Had no alternative as action by GMC was lacking
- Found it convenient as it is near the residents house
- Feared the potential ill - health from solid waste
- Followed the regulations of the GMC
- Peer pressure as other households were doing it

Source: Author, Field Survey, 2009

***5 – 6.4; ABSENT ROLE OF THE ALTERNATIVE SECTORS (DONOR AGENCIES, CBOS, NGOS, PRIVATE SECTOR ENTERPRISES)***

The council has not partnered with any donor agency nor the private sector in the management of waste within the municipality.

These institutions which ideal should act to mediate between the community and Government on virtually absent in the Garissa experience.

Also none of the residents reported either belonging to any Association or being aware of such association and its role. They have thus, unfortunately not been sensitized on formation and roles of self – interest / advocacy groupings.

Worse, there is no private collection agencies in Garissa, and majority throw out refuse into nearest street.

***5 – 6.5; LACK OF TRANSPARENCY IN RESOURCE USE***

As seen earlier, for unclear reasons, the residents posted varying amounts of charges levied by GMC. But as noted earlier, the council reported charging residents and commercial entities including hotels Kshs. 500 per year for garbage collection. This factor, coupled with the glaring gaps in the GMC's data, tend to point to Resource Mis-use, under-use or mis-allocation by the GMC, a fact strengthened by informal interviews with the municipal residents.

***5 – 6.6; GENDER NON-MAINSTREAMING IN SWM***

A unique phenomenon realized during the interviews is that most respondents cited the solid waste handling as being a women's role in the household. The analysis found this to

be an additional drawback and hence a challenge as males who traditionally dominate the households in African Communities and NEP in particular, ironically tend to relinquish their roles in this all important sector of Solid Waste Management.

**5 – 6.7 : DANGERS OF SCAVENGING FOR SOLID WASTE**

The phenomenon of scavenging for recyclable waste at the dumpsites and refuse bins is not entirely uncommon. But due to cultural inhibitions among the locals, it is not a very regular occurrence, and is mostly conducted by members of immigrant/non-indigenous communities. Thus the dangers of the trade in exposed refuse have yet to be fully realised.

**5 – 7; SUMMARY OF CRITICAL FINDINGS FROM FIELDWORK**

Waste management in Garissa town like in most towns in the South is very poor, a situation that has contributions from both the local authority and residents of the town. Despite submissions to the contrary by the Garissa Municipality, there clearly lacks an effective organised system to manage waste on behalf of the town’s dweller. Thus Solid Waste Management in Garissa Municipality appears as an eclectic phenomenon of strewn waste, frustrated residents (See Table 5-13 & 5-14) and a moribund, overwhelmed council.

**Table 5 – 13 ; Residents Rating of Impact Of GMC on SWM**

ITEM	RATING	PERCENT RATING
1.	Good	0.0%
2.	Moderately Successful	15.0%
3.	Below Average	15.0%
4.	Poor	70.0%

Source: Author, Field Survey, 2009

Table 5 – 14 ; Residents Reasons For Such Rating of Impact Of GMC on SWM

ITEM	RATING	PERCENT RATING
1.	GMC Non-concern & Neglect	28.1%
2.	Low awareness & Empowerment via GMC	5.3%
3.	Illiteracy about Hygiene & Sanitation	5.3%
4.	GMC levies & is paid for services if fails to deliver	22.8%
5.	Lack of adequate disposal sites	17.5%
6.	Poor Leadership & Management (Government)	10.5%
7.	Frequent prevalence of Diseases	5.3%
8	GMC has improved on Dumping Sites (Reasons cited by respondents who rated GMC as performing above average)	5.3%

Source: Author, Field Survey, 2009

*Garissa* town is a potentially beautiful Gateway to the North East, but the refuse heaps constitute an eyesore which impacts on its aesthetic appeal with respect to roadsides, open spaces and access roads, school and even mosque entrances. Further dismay is wrought by the foul smell of rotting refuse especially in wet weather.

Schumbeller(1996) once noted that the essence of sustainability demands Solid Waste Systems be absorbed and borne by the society upon which they originate and the accuracy of this statement was attested by the field survey of *Garissa* Municipality.

## **6.0 CHAPTER SIX - CONCLUSIONS. & POLICY RECOMMENDATIONS**

### **6 – 1; INTRODUCTION**

The above research and analysis of findings was diligently carried out over a sufficiently focussed length of time at the end of which some useful insights were obtained. The study identified various factors adversarial to efficient and effective SWM as low and poorly allocated resources, shortage of skilled personnel and low levels of service, and resident awareness.

### **6 – 2; CURRENT MITIGATION MEASURES BY THE GARISSA MUNICIPAL COUNCIL**

The council officials reported that the GMC organizes periodic general clean ups of the town on top of the routine clean-ups. The council was also reported as conducting civic education through public barazas and the mosques on the issue of responsible waste disposal among the residents. Also over the years the GMC has also built refuse chambers and placed trash bins along the streets which are meant to be regularly emptied.

However, these measures have not been enough, and additional detailed measures are hereby recommended ;

### **6 – 3 : SPECIFIC INSTITUTIONAL POLICIES AND STRATEGIES FOR GARISSA MUNICIPAL COUNCIL**

All institutions and policies touching on SW will have to reform before they can reform SWM .

#### ***6 – 3 .1; REFORMS AT THE GARISSA MUNICIPAL COUNCIL***

The current staffing structure of the Solid Waste Section of Garissa Municipality is grossly inadequate, (see Figs 5-2 & 5-3).

This study recommends that In addition to a traditional finance section, general administration and various other sections, it is recommended the GMC immediately establishes a fully fledged Environmental Division headed by a graduate Assistant Director. (See Fig 6- 3). The departmental head should report directly to the Clerk of the municipality. Under his watch shall be four sections as follows;

**Environmental Administration Section:**

Duties shall include; Specific Administration within the SWM section; Staff Issues; administration of contracts to private firms; consumer satisfaction, community sensitization/awareness & mobilization, Further, the Section will establish an Environment Planning Unit to maintain environment information systems to prevent minimize, and/or mitigate the adverse effects of SWM Pollution in the municipality towards forward planning.

**Environmental Treasury Section:**

Autonomously in charge of overall financial resources. This section will be in charge of Finance Planning & budget administration, as well as regular Auditing on income and expenditure so as to avoid funds misallocation as obtains at present, Solid waste revenue policy & taxes, capital requisitions, and staff emoluments.

It will charged with the unique task of aggressive but humane sourcing of finances be it in increment of appropriation from Government or revenue taxes on users/residents towards a financially semi-autonomous SWM Regime. Ochieng (2004) recommends that revenue collection must rise to 80% for self-sustaining SWM activities.

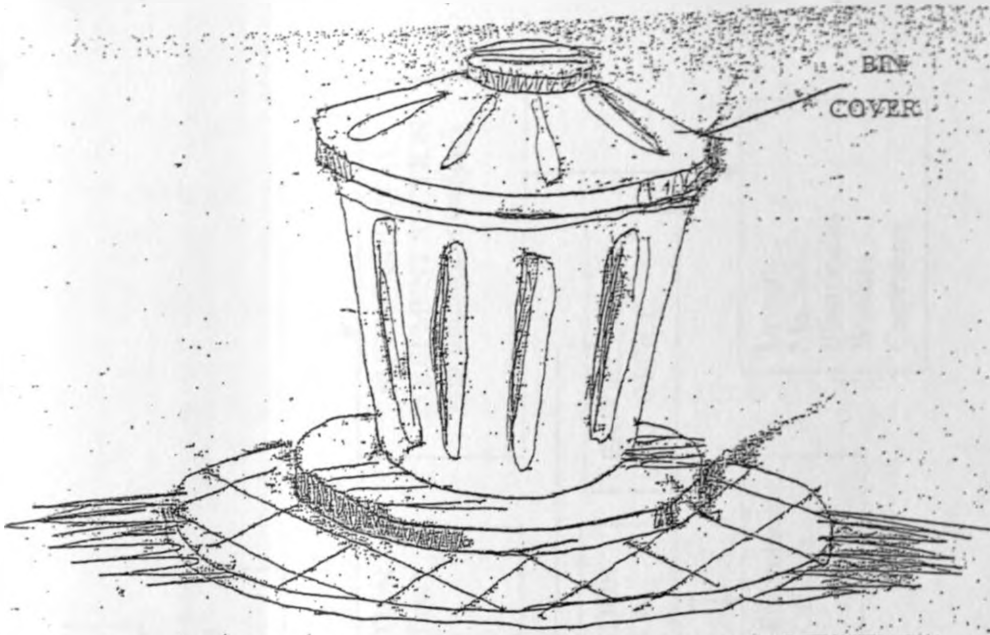


Fig 6 - 1 Proposed Standard Domestic Bin for Households (0.6 cubic m)  
 SOURCE: AUTHOR'S CONSTRUCTION

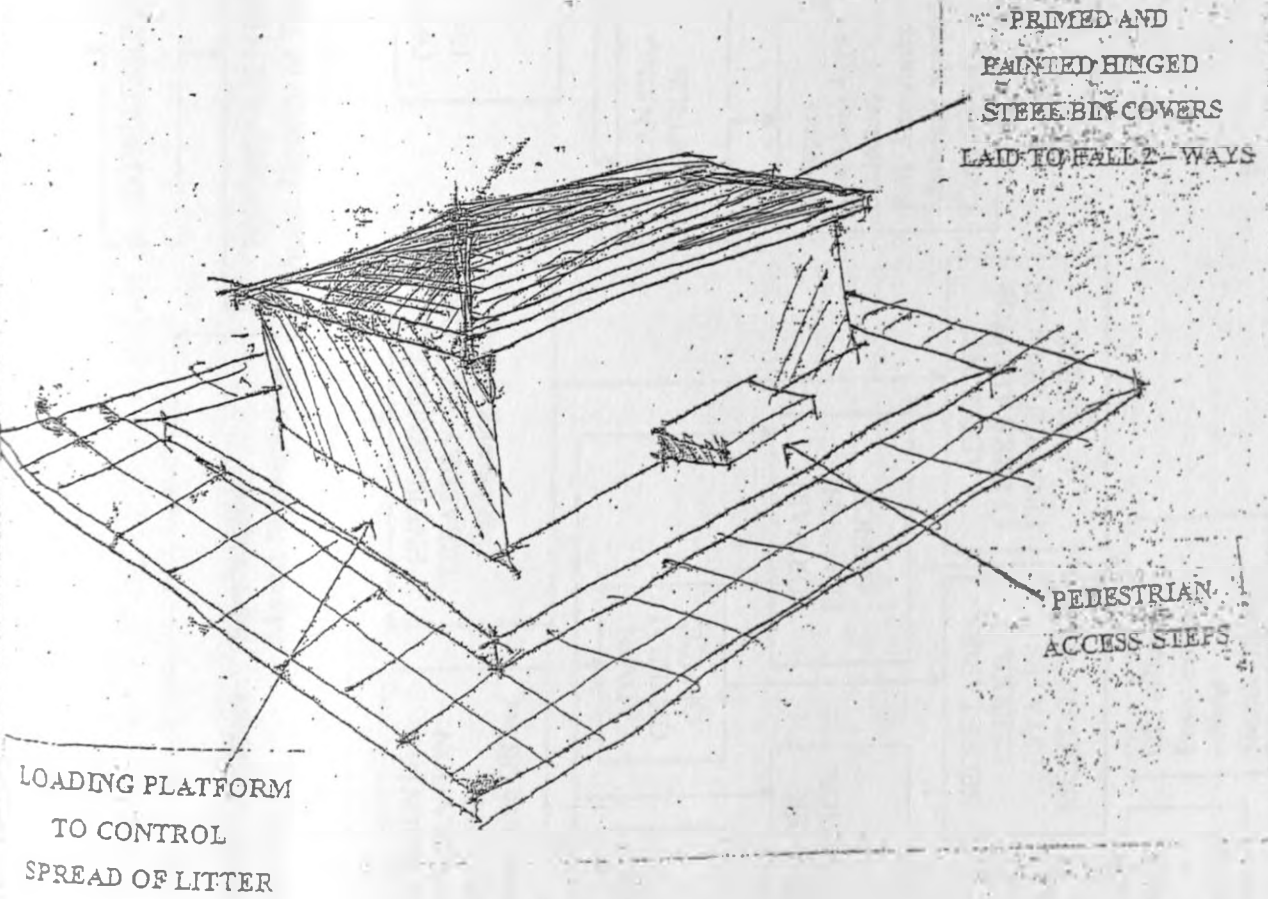
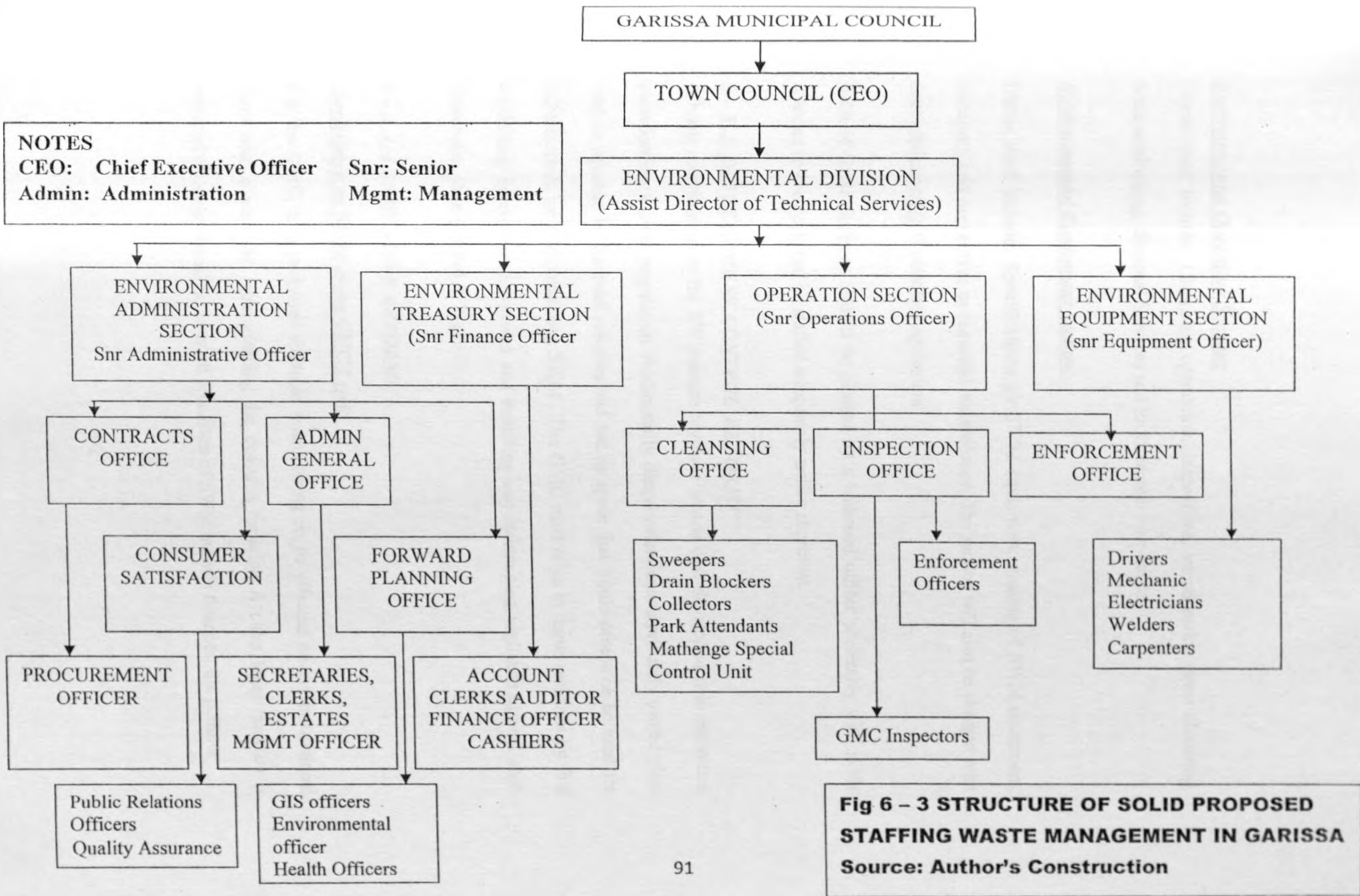


Fig 6 - 2 Proposed Bulk Refuse Permanent Bins (12 cubic m)  
 SOURCE: AUTHOR'S CONSTRUCTION





**Fig 6 - 3 STRUCTURE OF SOLID PROPOSED STAFFING WASTE MANAGEMENT IN GARISSA**  
**Source: Author's Construction**

**Environmental Operation Section:**

Duties shall include; Cleansing operations, Inspections, attend parks, street cleansing, drain unblocking, disposal Services and Enforcement operations.

**Environmental Equipment Section:**

Duties shall include; Specifications for SWM equipment, running of SWM equipment, transport, and preventive or remedial maintenance. The section will also be charged with decommissioning of obsolete equipment.

Each of these Sections should be headed by a technical officer preferably with skills relevant to his work and be staffed adequately unlike at present.

***6 – 3.2; DEVELOPMENT CONTROL REFORMS***

A basic contribution to the SW menace revolves around over-development in individual plots leading to over population. Additionally illegal extensions to privately owned plots tend to squeeze in the road reserves and eat up space that would otherwise be used for infrastructure services including SWM . The GMC must reign in rogue residents by first reclaiming appropriated portions and installing and maintaining vigilance against such tendencies. (See Fig 6-4 & Fig 6-5).

***6 – 3.3; LEGISLATIVE REFORMS***

**Legislation on SWM at the GMC Level:**

For the GMC, it is proposed strategic restructuring on be effected on the institutional front with a view of strengthening the councils capacity. A clear legal mandate is required to comprehensive cover all processes of SWM include finances, the polluter

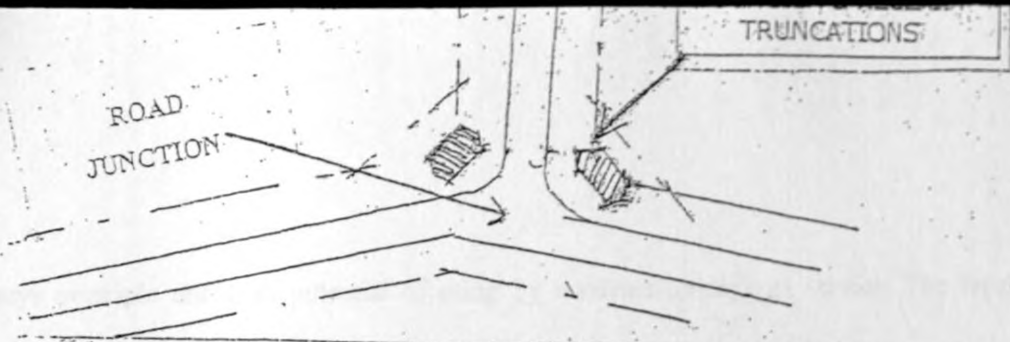


Fig 6 - 4 The GMC to Reclaim Irregularly Appropriated Land Truncations as Road Junctions for Placement of Bulk Refuse Receptacle Bins.  
SOURCE: AUTHOR'S CONSTRUCTION

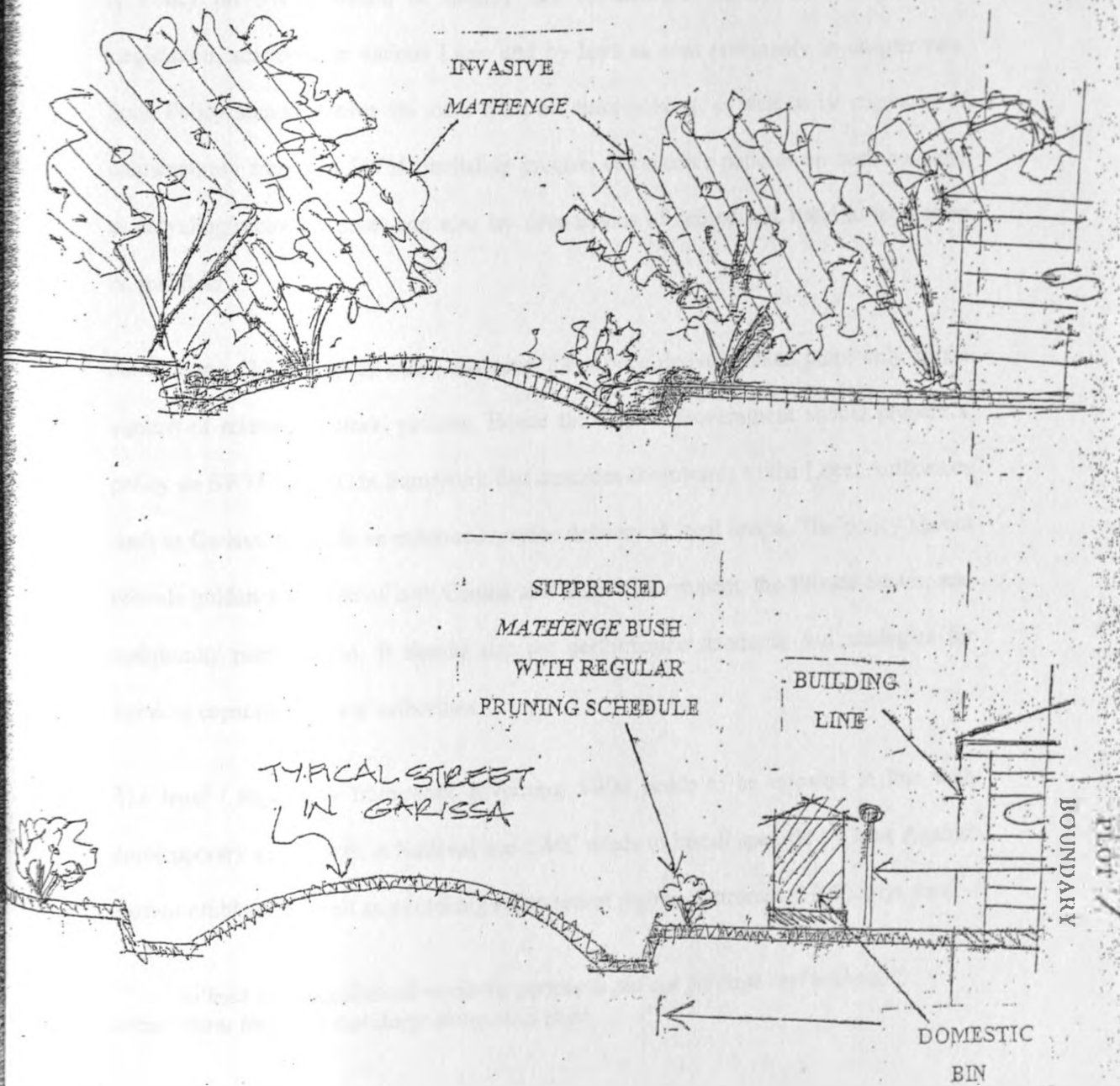


Fig 6-5 The GMC to Reclaim Road Reserves for Domestic Bin Placement as well as Access for Refuse vehicles  
SOURCE: AUTHOR'S CONSTRUCTION

pays principle and also potential of suing by residents for lack of service. The legal framework for a demolishing of illegal extensions should also be strengthened.

**Overall Legislation on SWM in General:**

A Policy on SWM should be drafted that collates and harmonises the pieces of Legislation, scattered in various Laws and by-laws as seen previously in chapter two. Such Policy should evolve via input from all stake-holders, as well as be cognisant of contemporary trends in SWM (including precise, enforceable policies on such concepts as recycling/recovery/reuse) and also lay foundations of subsequent specific legislation on this field.

As Ochieng (2004) rightly notes, planning for service delivery takes place only in the context of relevant sectoral policies. Hence the Central Government should prepare a policy on SWM to provide framework that cascades downwards to the Local Authorities such as Garissa, towards an enhanced service delivery at local levels. The policy should provide guidance on role of both Central and Local Government, the Private Sector, and community participation. It should also set performance standards and strategies for building capacity for local authorities.

The legal / regulatory framework governing SWM needs to be updated in line with contemporary needs both at National and CMC needs to install specific by laws Against current problems as well as a notching enforcement regime. Ostromet (1993) says that:

*“... .. without laws regulations requiring people to put out garbage and without enforcement they will just dump along road sides . . . . ”.*

#### 6-4 : SPECIFIC CAPACITY POLICIES AND STRATEGIES FOR GARISSA MUNICIPAL COUNCIL

One major problem discerned is general lack of information by residents about the advantages of proper solid waste handling, (eg waste control, prevention of littering, separation, recycling etc) as well as the adverse health impact. Further, due to low awareness, residents do not know there are statutes governing their right to clean living environment and good health. Yet the residents turned out as very sensitively and beware about the magnitude of the solid waste problem and health hazard posed by poor living environments and there was overwhelming returns on the absence of Municipal support, and existence of a large training gap, as well as a communication divide.

Thus to improve waste management capacity, this study recommends that the GMC should allow mid – wife and actively nurture the emergence of a vibrant alternative sector (CBOs, Private Enterprises, etc).

Esho(1997) sees privatization as a pragmatic means of improvement of service delivery. Dolores (1997) sees CP eg CBOs as providing (cost effective) and sustainable SWM. Muthoni (1999) outlines the economic potential of these groups in income generation and job creation and Geerts (1996) predicts privatization could stimulate overall economic growth of a municipality.

The unique phenomenon earlier stated in chapter five, where most respondents view the solid waste handling as being a women's role has a great potential of being exploited both towards a cleaner environment and to enhance economic empowerment of local women, Such empowerment is seriously wanting at present, in such a conservative

Islamic setting which perceives women as purely homemakers, who are best confined behind a veil at home, and men as the bread winners.

Women can be motivated to organise themselves and launch, operate and manage SWM activities as members of micro-enterprises. Ochieng (2004) reports that Latin American countries such as Bolivia, Costa Rica, Peru and Colombia, Micro-Enterprises for Waste collection, street sweeping among other activities are often dominated by women.

Further, Ocampo (1992) cites a case where women are sometimes deeply involved in the management of the SWS system as in Indonesia where the system is run by the wives of the local administrative leaders and in Mexico where 90% of women in the community are active in recycling systems with most being co-operatively run.

However, conflicts of interest do emerge between environmental quality and profitability for CBOs, Private Enterprises, etc in the SW business and Hall (2001) advocates effective safeguards by the Municipal Authorities. Hence the potential rise of a private SWM sector must be heralded by a controlling and regulatory regime run by the GMC, which must formulate, enshrine and retain overall localised legislative, supervisory and control functions.

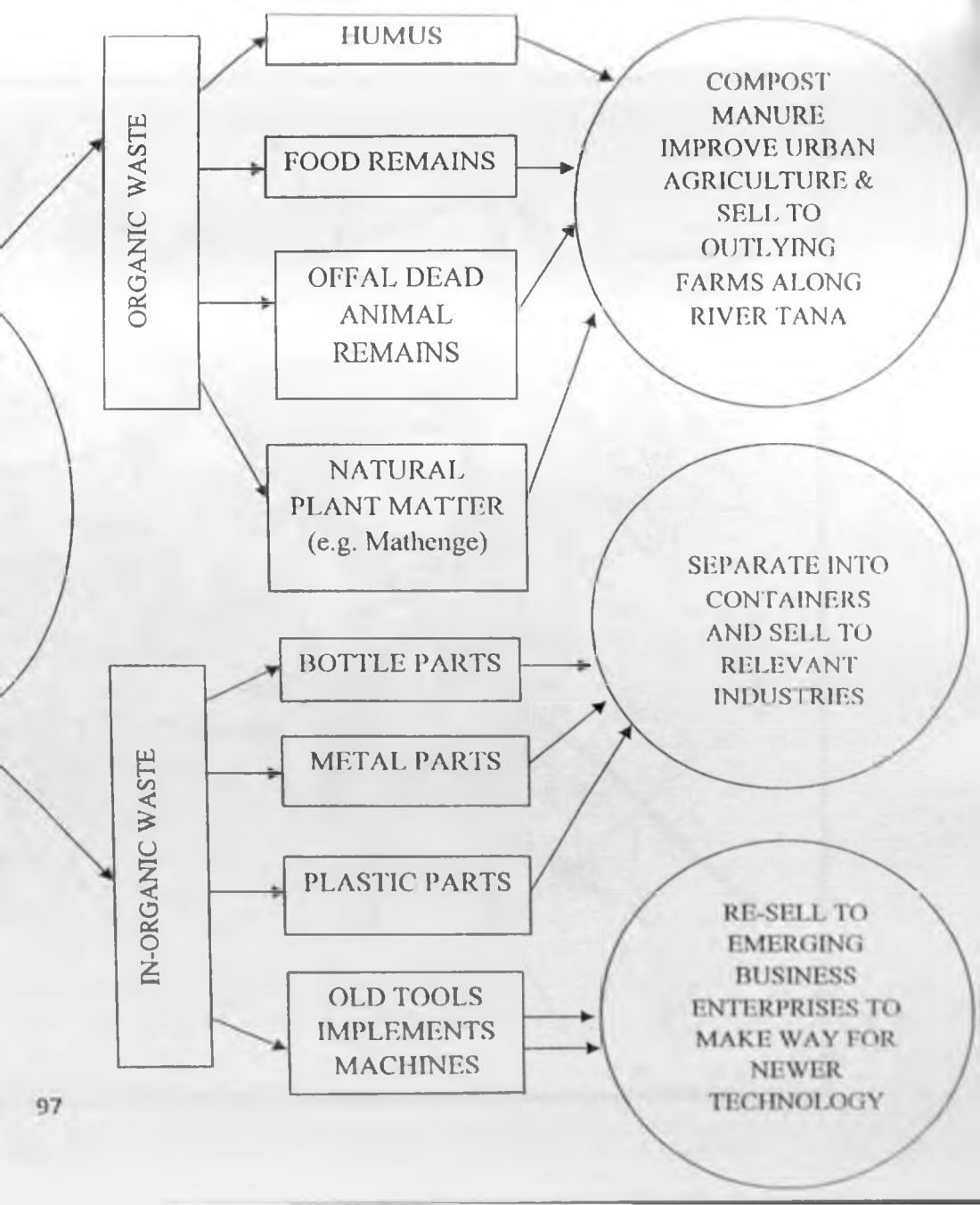
## **6 - 5 : SPECIFIC OPERATIONAL POLICIES AND STRATEGIES FOR GARISSA MUNICIPAL COUNCIL**

### **6 – 5.1 ; *THE GMC TO REFORM FIELD OPERATIONS***

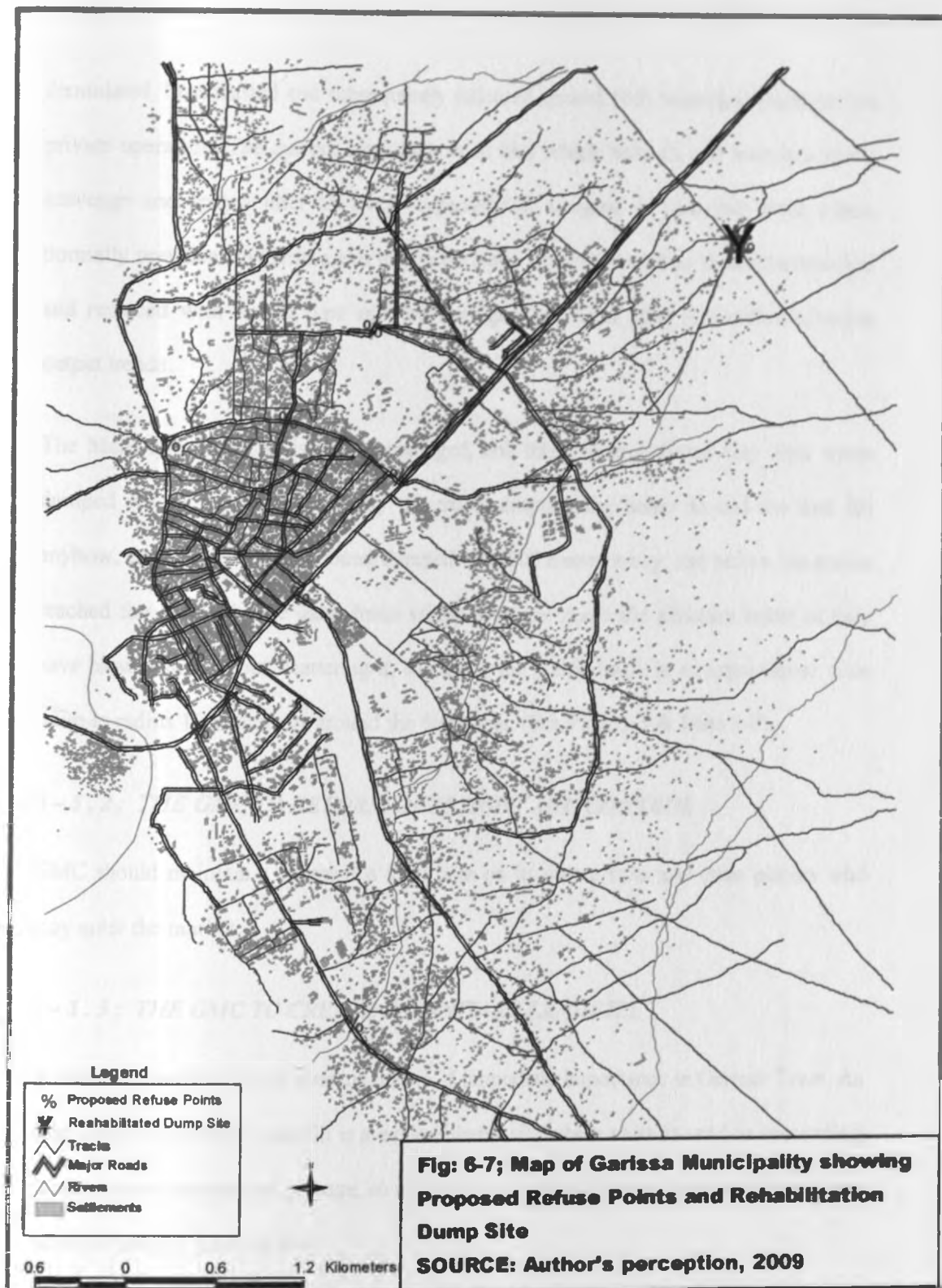
The GMC is to re-brain storm on actual field operations and whether the current system represent best practice. Current schools of thought advocate waste separation (See Fig 6-6), and sealing in closed containers(See Figs 6-1 & 6-2). Fresh regulations should be

**FIG 6-6: FLOW CHART DEPICTING  
RECOMMENDED WASTE SEPARATION,  
PACKAGING, RECYCLING AND DISPOSAL**  
Source: Author's Construction









formulated, broadcasted and subsequently enforced against both municipal residents and private operators. The current run-down open bins which animals and *marabou storks* scavenge and spread litter all over especially in a region of near gale-force winds, normally prevalent in Garissa and the wider North Eastern Province, should be removed and replaced with closed type and the strategically placed after revaluation of waste output trends.

The Municipal dumpsite is poorly managed, and this Research found very little waste dumped within the landfill. Mostly the trucks emptied the waste around the land fill anyhow, and waste was even found dumped over 500 meters away, and before, the trucks reached the land fill. The gale- force winds have not made the situation better as they have blown waste about, scattering it, especially the plastic bags, in an approximate area of up to radius 10 kilometers around the dump-site. (See Plate 5-7 & Plate 5-8).

#### ***6 – 5 . 2 ; THE GMC TO REFORM OVERSIGHT AND CONTROL***

GMC should maintain a continuous vigil both on its own efforts and other players who may enter the market.

#### ***6 – 5 . 3 ; THE GMC TO CREATE A SANITARY LANDFILL***

A Sanitary Landfill is long overdue and is of immediate importance in Garissa Town. As seen before, a Sanitary Landfill is a sunken dump site where earth is used in succeeding layers to cover compacted garbage, so as to prevent it from blowing away and keep down offensive smells. (See Fig 6-7)

To mitigate against the anticipated blown garbage, foul smells, rodent infestations, and the potential to contaminate the underlying groundwater with *leachate* (S. Swanson, 2000). The GMC should excavate the existing landfill to a level of five metres below ground with slanted edges, (an area of four acres or 16,000 square metres should serve well for the next 15years). Thick waterproofed linings (made of impermeable clay and strips of plastic heat-sealed together) are to be installed along all the surfaces.. Additionally a system of pipes should be installed to collect *leachate* within the landfill and carry it to a treatment facility. Other pipes can draw off all the gases that the rotting garbage will inevitably give off.

## **6 – 6 : OTHER GENERAL POLICIES AND STRATEGIES FOR THE GARISSA MUNICIPAL COUNCIL IN ITS ROLE OF PROVISION OF SWM SERVICES**

### **6 – 6 .1: *THE GMC TO INVEST IN STAFF MOTIVATION***

Other than staffing improvement in terms of number, incentives to motivate current workforce against low morale should be identified and installed.

### **6 – 6 .2: *THE GMC TO INVEST IN INTRA-DEPARTMENT, INTER-DEPARTMENT HARMONY***

GMC should promote good relations amongst its staff and with external actors devoid of acrimony and negative competition that will down – grade the fight against SW menace.

### **6 – 6 .3: *THE GMC TO ADOPT STRATEGIC PLANNING, THE ULTIMATE ROUTE FOR SWM IN GARISSA***

Analysis of the information obtained from the field survey of this research leads to the conclusion that matters would not have fallen that far apart had adequate planning occurred at the first instance.

An even better situation would be obtaining today if the planning had been of a continuous evolving nature, a phenomenon in modern day planning tool – kit called

**Strategic Planning.**

- *As seen earlier; Planning entails setting out on activity towards a goal.*
- *On the other hand: Strategic Planning entails establishment of time specific objectives and guiding the resources towards them.*

**Box 6-1; Summary Strategic Planning Methods**

**SWOT Analysis** is a **STRATEGIC PLANNING METHOD** used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or in a business venture. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieving that objective. The technique is credited to Albert Humphrey, who led a convention at Stanford University in the 1960s and 1970s using data from Fortune 500 companies.

A SWOT analysis must first start with defining a desired end state or objective. A SWOT analysis may be incorporated into the strategic planning model. An example of a strategic planning technique that incorporates an objective-driven SWOT analysis is Strategic Creative Analysis (SCAN)<sup>(1)</sup>. Strategic Planning, including SWOT and SCAN analysis, has been the subject of much research.

Identification of SWOTs is essential because subsequent steps in the process of planning for achievement of the selected objective may be derived from the SWOTs.

First, the decision makers have to determine whether the objective is attainable, given the SWOTs. If the objective is NOT attainable a different objective must be selected and the process repeated.

Source: The Internet ; [www.wikipedia.com](http://www.wikipedia.com)

#### **6 – 6.3.1 : Strategic Planning And Swm ; Protagonists Views**

Various scholars and thinkers have over time talked the SW questions and all agree that without proper plans all efforts at tackling the garbage menace will be of limited value.

Ostromet(1993) points out that SWM has to be approached systematically and decries the tendency for DCs to mistake SWM for a non-professional industry both in employment of equipment and human personnel.

Rondinelli(1990) outlines two aspects of infrastructure delivery as first the provision (determination of requirements in quantity and quality) and secondly production (deployment of resources and staff).

UNEP (1992) asserts that a SWM framework can only be put in place once the levels of waste stream their properties, toxicity and hazards to human health and the environment has been established.

Schumbeller(1996) declares that municipal SWM must involve planning forecasting, organization and execution of the functions of collecting, transferring treating recycling, resource recovery and disposal of solid waste.

#### **6 – 6.4 : THE GMC TO INSTITUTE AWARENESS PROMOTION**

Experts generally agree that SWM begins at source. There is thus a need for comprehensive Civic Education of the town's residents, to impart the right SW attitudes and encourage best practices. The GMC customer satisfaction Division should launch programmes to increase awareness among residents and other actors, on the following topics among others ;

- *They should also be motivated to launch Community based Initiatives and develop an entrepreneurial, rather than negative cultural attitude to Solid Wastes*
- *Residents to be sensitized on waste reduction at sources, waste separation, waste recycling, and waste recovery. They should also be motivated to separate & pack Non-Bio- Degradables in separate containers for sale to private Sector.*
- *Residents to receive training on Composting techniques on Bio- Degradables for Rejuvenation of Agriculture, as well as Fibre-Reinforced-Dung Coal for severe Fuel Needs*
- *They should also be trained on Proper and hygienic methods to handle waste*

To facilitate waste separation, re-cycling, large containers for the various types of recyclables can be set up either near houses or in convenient locations, so that residents can drop off recyclables regularly. Centres to buy back re-usable waste should also be established, giving especially the poor & infirm an incentive to recycle by paying them for their separated waste.

At the Policy Levels prevention of production of non – biodegradables can be attained by sale of re-usable recyclable products. Companies can be encouraged to shift to paper packaging materials in various ways. Recycling (See Box 6-2) reduces amount of solid waste that needs collection, transport and disposal. CBOs can create robust public education vehicles. The CBOs can also create waste redemption centres (WRCS) tasked with buying recyclables and Garissa residents can be sensitized to sell at these centres. Since Garissa, being a desert environment, is further inundated with unemployment. such activities, may earn income for sellers and also create employment to operators &

brokers. Composting education may herald better scientific methods. It may enrich the sandy soils slow leaching of water in the sandy Garissa Town soils and thus better support plant materials. Such efforts combined with advantage of the nearby Tana River can aid regulated urban agriculture and further reduce unemployment.

Most times the installation of a robust solid waste collection scheme must be combined with consumer education and Ochieng (2004) reports such cases as widespread in Mali, Mexico, and Nepal.

Davinder (1987), when reporting on AMREF's projects found they have demonstrated that residents are willing to participate in cleaning up their neighbourhoods and one willing to share some of the costs

Finally, as is the trend in other City/Municipal/Town Councils in Kenya The Local Authority in Garissa must initiate, encourage and actively promote the emergence of a vibrant private sector that acts to bridge the huge divide identified between the Council and the Dwellers in this discussion.

#### **Box 6 - 2; Recycling Systems; A Case Study of the USA**

In the United States by the end of 1991 there were about 3,500 recycling collection programs, picking up recyclables from 15 million households. About 40 percent of these programs, mostly in the Northeast, California, and Minnesota, were mandatory, meaning that residents faced fines if they did not separate recyclables from ordinary garbage.

In impoverished neighbourhoods, buy-back programmes targeting recyclables are installed. One such programme on Chicago's West Side in the United States has paid local residents more than one million dollars (eighty million shillings) for their recyclables since opening in 1984.

Source: Swanson (2004)

## **6 – 6.5: THE GMC TO REFORM INFRASTRUCTURE PLANNING**

### **Equipment Planning**

After adequate mapping out of waste generation scope and SWM requirements projected for a given length of time (e.g 5 years framework that is the basic MTF interval in bathe the NDPs and Vision 2030) the forward planning division should draw up Infrastructure requirements with a view to negotiating a budget from central Govt whose end term goal is to optimize the SWM standards. A recurrent finance plan should also be negotiated. GMC should also contemplate a streamlining the cess charge for SW with a view to partial self sufficiency.

### **Finances Planning**

One major problem facing the GMC as noted earlier in provision of solid waste management services is lack of adequate financial resources.

For the GMC, it is proposed that strategic restructuring be effected on the financial resources front with a view of strengthening the councils capacity. Ochieng (2004) conceptualizes that these financial gaps can be bridged through a well administered system of budgeting control coupled with a sound basis for levying and collecting local taxes.

Later when private operators enter the arena, the GMC fleet and Personnel can serve as a standby / backup for SW services and equipment for time by private operators. The GMC may not change residents but can attract a small fee from Private Operators e.g. annually.

## **6 – 6.6: THE GMC TO INSTITUTE ENVIRONMENTAL PLANNING REFORMS IN GARISSA**

Mbui (1995) notes that current interest in the quality i.e. the quality of the natural environment (land, air, water e.t.c) and development of our urban environments ranks highly as an evolving public concern. As Schumbeller (1996) warns;



*"Aggressive Pursuit For Personal Goals,  
Accruing In The Enjoyment Of Positive Benefits,  
Sometimes Yields Regrettable Negative Consequences  
That Affect The Entire Population"*

The District Environment Departments must initiate active programmes that comprise the following;

- 3.2.1 *Promotion of awareness on aspects of waste such as plastic, scrap metals and bottles that do not rightly rank as problems to be disposed of but opportunities has revenue.*
- 3.2.2 *They should also sensitize SME sector players (eg metal, wood printing, leather tanning e.t.c. workers) who Kipkurui (1997) ranks amongst the worst environmental offenders, on the danger posed and best practise standards.*

Table 6 - 1 ; A Comparison Of Environmental Effects Of Various Modes Of Waste Handling

CRITERIA	METHOD			
	<u>Incineration</u>	<u>Resource Recovery</u>	<u>Crude Dumping</u>	<u>Controlled Tipping</u>
Environmental protection	Good	Good	V. Bad	Good
Land requirements	Minimal	Fair	Massive	High
Financial requirements	High	Minimal	Minimal	High
Eco Benefits	-	Fair	-	-
Land Degradation	None	None	Massive	Massive
Health & safety	Good	Good	None	Fair

Source Njau (2004)

3.2.3 They should educate all players on realistic on alternative uses of domestic waste (e.g for composting, soil fertility improvement) and also the aspect of resource recovery (bottles metal and plastics) they should point out the employment creation potential to reduce idling, favourite pastime among the local youth who invariable give job scarcity as reason to chew *miraa (khat)* night and day.

3.2.4 In line with SP, the department should roll out time specific programmes with measurable indicators (Strategic Planning).

### 6 – 6.7: THE GMC TO ADOPT CONTEMPORARY TOOLS FOR FORWARD PLANNING

The GMC must actively pursue accurate parameters for forward planning and prepare concrete environment action plans. The range of relevant tools has been enhanced with advances in science and technology as well as lowered cost of communication after the advent of Fibre-Optic Technology.

Table 6 -2; Residents Suggestions Of General Improvements On SWM

ITEM	IMPROVEMENT	PERCENT SUGGESTING
1.	More Dustbins	28.1%
2.	Establish of Private Companies by CBO's and build strong linkages to community & stakeholders	5.3%
3.	Promotion of more awareness about Hygiene & Sanitation by GMC	5.3%
4.	GMC to start performing roles effectively and cost effectively	22.8%
5.	More Garbage Vehicles	17.5%
6.	A Cleaner Town with regular / frequent clean-ups about once a week.	10.5%

Source: Author, Field Survey, 2009

Additionally the current Urban Waste Management Strategies employ recent scientific advances such as Geographic Information System and Mapping techniques to map out waste sites sizes potential growth. This if adopted by the GMC will greatly aid forward planning. The GMC should also continuously be on lookout for other tools employed in other SWM scenarios locally and abroad.

Accurate and timely information is paramount for urban planning specifically in service delivery (Ochieng 2004).

## 6 – 7 : SUMMARY

### Box 6 - 3; Summary of Proposed Synergetic Roles for SWM in Garissa

- |  |
|--|
| <p>a) <b><u>THE RESIDENTS:</u></b></p> <ul style="list-style-type: none"><li>✓ <i>Civic Education</i></li><li>✓ <i>Waste generation</i></li><li>✓ <i>Waste Seperation</i></li><li>✓ <i>Waste Disposals to Best- Practice standards</i></li><li>✓</li></ul> <p>b) <b><u>PRIVATE SECTOR</u></b></p> <ul style="list-style-type: none"><li>✓ <i>This includes Community Based Groups, Welfare Associations, Non Governmental Organizations, The Advertising Fraternity</i></li><li>✓ <i>They are to create Collection Agencies/Trusts</i></li><li>✓ <i>Provide Capital and Financing</i></li><li>✓ <i>Propose reasonable levies and collect payments from service recipients/residents</i></li><li>✓ <i>Bridge huge gap by providing equipment for Waste Storage at the local levels (Refuse Bins, Plastic Bags of Government approved specifications,)</i></li><li>✓ <i>Enhance Transport Situation at local levels (Hand-carts, Donkey-Carts, Barrows, Shovels)</i></li><li>✓ <i>Training of Households/Individuals on SWM and the environment</i></li><li>✓ <i>Creation of Employment</i></li><li>✓</li></ul> <p>c) <b><u>GARISSA MUNICIPAL COUNCIL</u></b></p> <ul style="list-style-type: none"><li>✓ <i>Formulate Regulatory Framework</i></li><li>✓ <i>Licence and regulate all SWOs for a reasonable fee</i></li><li>✓ <i>Provide and Zone out Collection Sites/points</i></li><li>✓ <i>Enhance equipment &amp; mode of Bulk Waste Transport</i></li><li>✓ <i>Effective overall supervision/control of all actors in the SWM regime</i></li><li>✓ <i>Training/awareness of All SWOs in the SWM</i></li><li>✓ <i>Construct a Sanitary Dumpsite to best- practice standards</i></li></ul> |
|--|

Source: Author's Construction

It is clear from the foregoing discourse of this discussion on Solid Waste Management in Garissa, that though the main stakeholders (the Residents on one hand, and the Municipal Council on the other), may show some divergence in opinion on the genesis, scope and magnitude and attributive role in its exacerbation, they non-the less tend to share similar & uniform ideas on the way forwards towards a solution of the Solid Waste Problem.

More importantly, these insights from both sides of the divide single out acute failure of Garissa Municipal Council to efficiently deliver sound SWM as stemming largely from internal administrative malfunctions, and only to a minor extent, external factors.

This study has conclusively recommended a comprehensive range of Strategic Urban Planning procedures that will involve a synergetic relationship between the residents/public sector and private sector under the umbrella stake-holder regulatory framework supervised by the Municipal Authority. The various specific roles in the area of SWM, summarised in Box 6-3 below, will restore Garissa Town to its original glory and sparkle.

## 6 – 8 : AREAS OF FURTHER RESEARCH.

A work of this nature cannot be exhaustive in nature and some areas must be left to other researchers in future. Areas that were beyond the scope of this study were;

### *6 – 8.1 : EFFECTS OF SOLID WASTE STREAM ON TANA RIVER*

This 700 km long river is a lifeline to inhabitants traversing four provinces. The effects on the water quality of this river, and consequently to the health of the users especially downstream, caused by of water run off from the multitudes of rotting refuse dumps and garbage choked drains, are yet to be ascertained.

### *6 – 8.1 : EFFECTS OF SOLID WASTE STREAM ON GARISSA UNDERGROUND WATER TABLE*

Similarly, although there was no ready evidence of chemical waste poorly disposed within the Municipality, the effects of waste on the water quality of this river, and consequently to the health of the users of boreholes, caused by of water *leachate* from rotting refuse dumps and below-standard Landfills, are yet to be ascertained.

### *6 – 8.1 : THE "MATHENGE" TREE (PROSOPIS JUNIFLORA)*

Further research is required on the properties and benefits of this prolific tree species as it significantly contributes to the waste stream due to its prolific and ubiquitous nature.

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# APPENDICES

## APPENDIX 1 :

### MUNICIPALITY RESIDENTS' QUESTIONNAIRE

#### QUESTIONNAIRE FOR MUNICIPAL RESIDENTS

GOOD MORNING / AFTERNOON.

KINDLY ANSWER THE FOLLOWING BRIEF QUESTIONS. THE EXERCISE WILL ONLY TAKE TEN MINUTES.

NAME..... AGE.....

PLOT NO ..... HSE NO.....

1. BRIEFLY DESCRIBE THE AVERAGE CONTENTS OF YOUR DOMESTIC GARBAGE OUTPUT (SOLID WASTE ONLY)

- i) Vegetable material & average peelings etc..... approx amount. (kg per week).....
- ii) Left over food stuffs .....approx. amount. (kg per week) .....
- iii) Natural Detritus (Plant leaves & Humus)..... approx. amount (kg per week).....
- iv) Glass based waste .....approx. amount ( kg per week) .....
- v) Paper based waste .....approx. amount (g per week) .....
- vi) Plastic/polythene .....approx. amount ( g per week) .....
- vii) Metallic Based Waste .....approx amount (kg per week) .....
- vii) Other( Please specify) .....
- .....approx. amount (kg per week) .....

2. HOW DO YOU DISPOSE OF YOUR GARBAGE? (Tick one as appropriate)

- i) THROW IT OUTSIDE (KINDLY STATE WHERE, HOW FAR FROM HOUSE & WHY)  
.....
- ii) RETAIN IT & BURY WITHIN YOUR RESIDENCE .....
- iii) RETAIN & INCINERATE WITHIN YOUR RESIDENCE .....
- iii) PRIVATE COLLECTION (STATE BY WHICH COMPANY/COMPANIES).....
- iii) MUNICIPAL SERVICE COLLECTION (STATE HOW FREQUENTLY).....
- .....
- iv) ALL OR SOME OF THE ABOVE (PLEASE SPECIFY)  
.....
- .....

v) OTHER METHOD(S) (KINDLY SPECIFY)

.....  
.....

3) WHY DO YOU PREFER THE METHODS ABOVE ? (Tick one as appropriate)

a) TO FOLLOW REGULATIONS LAID DOWN SET BY THE MUNICIPAL COUNCIL.....

b) OTHER HOUSEHOLDS DO THE SAME THING, SO I FEEL IT IS OKAY .....

c) OTHER REASONS (KINDLY SPECIFY) .....

.....  
.....

4). EXPLAIN WHETHER YOU PARTLY PROCESS YOUR SOLID WASTE BEFORE DISPOSAL. DO YOU SEPARATE AND PACKAGE ACCORDING TO DIFFERENT TYPES?

.....  
.....  
.....

DO YOU HAVE ACCESS TO A SOLID WASTE SOLID DUSTBIN ? IS IT OWNED BY YOURSELF IN YOUR PREMISES ?

.....  
IF NOT SELF-OWNED, HOW FAR IS IT FROM YOUR YOUR RESIDENCE ?

.....

5). DO YOU PERFORM ANY OTHER PROCESSING TECHNIQUES? KINDLY EXPLAIN.

.....  
.....

6). DO YOU BELONG TO A NEIGHBOURHOOD ASSOCIATION (S) ? IF SO NAME IT/THEM .

.....

OUTLINE WHAT THE ASSOCIATION DOES WITH REFERENCE TO GARBAGE MANAGEMENT.

.....  
.....

7). HOW OFTEN DO YOU SEE MUNICIPAL COUNCIL OFFICIALS VISITING YOUR NEIGHBOURHOOD? (Tick one as appropriate)

i) ONCE A DAY .....

ii) THREE TIMES A WEEK .....

iii) ONCE WEEKLY .....

ii) MONTHLY .....

iii) SEVERAL TIMES A YEAR)..... HOW MANY TIMES? .....

iii) NEVER .....

EXPLAIN WHAT THEY CAME TO DO THE LAST THREE TIMES YOU SAW THEM? ( REASONS COULD RANGE FROM COLLECTING FEES,GARBAGE, INTERVIEWING RESIDENTS, BRINGING GARBAGE COLLECTION EQUIPMENT,ETC )

i) DAY 1 ; .....

ii) DAY 2; .....

iii)DAY 3 ; .....

.....  
WOULD YOU LIKE THEM TO VISIT MORE OFTEN?  
.....

HOW OFTEN? .....

EXPLAIN WHY ? .....

8). ARE YOU PAYING ANY DIRECT LEVIES ON GARBAGE DISPOSAL AND IF SO HOW MUCH PER MONTH?  
.....

IF NOT, WOULD YOU BE WILLING TO, & IF SO, HOW MUCH PER MONTH?  
.....

9). WHAT IN YOUR VIEW IS THE CURRENT OVERALL IMPACT OF THE MUNICIPAL COUNCIL SOLID WASTE DISPOSAL SYSTEM IN GARISSA? ? (Tick one as appropriate)

- a) *HIGLY SUCCESSFUL*
- b) *MODERATE SUCCESSFUL*
- c) *AVERAGE*
- d) *BELOW EVAREAGE*
- e) *POOR*

GIVE REASONS  
.....  
.....

10).SUGGEST IMPROVEMENTS YOU WOULD WISH TO SEE IMPLEMENTED IN THE AREA OF GARBAGE MANAGEMENT IN GARISSA

Improvement (1) :.....

By Which Agency.....

Improvement (2) :.....

By Which Agency.....

Improvement (3) :.....

By Which Agency.....

Improvement (4) :.....

By Which Agency.....

**THANK YOU FOR YOUR TIME & CO-OPERATION**

**APPENDIX 2 :**

**SENIOR MUNICIPAL OFFICIALS' QUESTIONNAIRE**

**QUESTIONNAIRE FOR MUNICIPAL OFFICIALS**

GOOD MORNING / AFTERNOON

OUTLINE THE HISTORY & CURRENT NATURE OF THE LEGAL / REGULATORY FRAMEWORK WITH SPECIFIC REFERENCE TO GARBAGE MANAGEMENT .(KINDLY ATTACH CURRENT AND/OR BACKGROUND REFERENCE LITERATURE WHERE APPLICABLE/ AVAILABLE WHICH WILL SOLELY BE USED FOR ACADEMIC PURPOSES ONLY).

1. BRIEFLY DESCRIBE THE AVERAGE COMPOSITION & SOURCES OF THE LOCAL MUNICIPAL SOLID WASTE OUTPUT

- i) Solid Waste Item: .....  
Average Amount (tonnes per week).....  
Sources.....
- ii) Solid Waste Item: .....  
Average Amount (kg per week).....  
Sources.....
- iii) Solid Waste Item: .....  
Average Amount (kg per week).....  
Sources.....
- vii) Solid Waste Item: .....  
Average Amount (kg per week).....  
Sources.....

2. HOW DOES THE COUNCIL DISPOSE OF SOLID WASTE & WITHIN WHAT CONSTRAINTS?

.....  
.....

HOW OFTEN DOES THE COUNCIL COLLECT & DISPOSE WASTE ? DISCUSS THE FREQUENCY BASED ON ITEMS OF EQUIPMENT IN YOUR POSSESSION

.....  
.....

DOES THE COUNCIL HAVE DUMPSITES OR NATURAL LAND FILLS ? DESCRIBE NUMBER, NAMES & LOCATIONS

.....  
.....  
.....

IF NOT, STATE THE FINAL END POINT OF THE SOLID WASTE MANAGEMENT PROCESS

.....  
.....

3. LIST THE RELATIVE STRENGTH OF THE COUNCIL (RESOURCES, TOOLS & ALLOCATIONS) WITH SPECIFIC RELEVANCE TO SOLID WASTE DISPOSAL

- i) PERSONNEL.....

ii) KINDLY DESCRIBE THE VARIOUS CADRES AND THEIR RESPECTIVE ROLES ;

- a. ....
- b. ....
- c. ....
- d. ....
- e. ....
- f. ....
- g. ....
- h. ....
- i. ....

iii) TRACTORS.....

iv) TRUCKS.....

v) OTHER VEHICLES.....

vi) SMALL EQUIPMENT ( DESCRIBE )...

- a. ....
- b. ....
- c. ....
- d. ....

vii) FINANCIAL RESOURCES ( DESCRIBE )

- a. Amount (kSH per FY).....source(s).....
- b. Amount (kSH per FY).....source(s).....
- c. Amount (kSH per FY).....source(s).....
- d. Amount (kSH per FY).....source(s).....

viii) OTHER RESOURCES ( DESCRIBE )

- a. ....
- b. ....
- c. ....
- d. ....
- e. ....
- f. ....

DOES THE COUNCIL REGARD THESE RESOURCES & TOOLS AS ADEQUATE WITH SPECIFIC RELEVANCE TO SOLID WASTE DISPOSAL (EXPLAIN)

- Item.....
- How Inadequate.....
- .....
- Item.....
- How Inadequate.....
- .....
- Item.....



How Inadequate.....

Item.....

How Inadequate.....

4. ARE THERE OTHER GARBAGE MANAGEMENT BODIES AND IF SO WHICH?

i) Body 1.....

Role ..... Assigned by.....

ii) Body 2.....

Role ..... Assigned by.....

ii) Body 3.....

Role ..... Assigned by.....

iv) Body 4.....

Role ..... Assigned by.....

5. WHAT IS THE APPROXIMATE PERCENTAGE LEVELS OF RELIEF TO YOUR WORKLOAD BY THESE BODIES?

.....  
.....

EXPLAIN IN WHAT WAY?

.....  
.....

6. IF THESE BODIES DO EXIST, DO THEY PARTNER WITH YOU UNDER ONE FRAMEWORK OR OPERATE IN SEPARATE SYSTEMS? BRIEFLY EXPLAIN.

.....  
.....  
.....

7. SOME STREETS CORNERS EXHIBIT RANDOM HEAPS OF SOLID WASTE DUMPED BY DOMESTIC HOUSEHOLDS & SMALL BUSINESSES. IS THIS A STANDARD DESIGNATION OF THE COUNCIL?

.....  
.....

8. IF SO, HOW MANY ARE THE DESIGNATED POINTS AND WHICH ONES?

.....  
.....  
.....

9. WHAT FAILS THE SYSTEM? BRIEFLY OUTLINE THE OVERALL SUCCESS AND/OR FAILURES OF THE SYSTEM.

.....  
.....

.....  
10. IF NOT, WHAT ACTUAL SYSTEM SHOULD BE IN PLACE TO GOVERN RESIDENTS' ATTITUDE  
BEHAVIOUR TO SOLID WASTE DISPOSAL?

.....  
.....  
.....

WHY IS IT NOT IN PLACE?

.....  
.....  
.....

11. EXPLAIN IF THE COUNCIL HAS EVER CONSIDERED AND/OR BEEN ENGAGED IN SOLID  
WASTE SEPARATION INTO COMPONENTS & THE LEVEL OF INVOLVEMENT.

i) Deliberations at PHC Level: .....  
Dates.....

Decision & Action.....  
.....

ii) Deliberations at GPC Level: .....  
Dates.....

Decision & Action.....  
.....

iii) Deliberations at Full Council Level: .....  
Dates.....

Decision & Action.....

iv) Deliberations at Other Levels: .....  
Dates.....

Decision & Action.....  
.....

v) Any other Action: .....  
Dates.....

Nature of Action.....  
.....

12. EXPLAIN IF THE COUNCIL HAS EVER CONSIDERED AND/OR BEEN ENGAGED IN SOLID  
WASTE RECYCLING & THE LEVEL OF INVOLVEMENT.

i) Deliberations at PHC Level: .....  
Dates.....

Decision & Action.....  
.....

ii) Deliberations at GPC Level: .....  
Dates.....

Decision & Action.....  
.....

iii) Deliberations at Full Council Level: .....  
Dates.....

Decision & Action.....

iv) Deliberations at Other Levels: .....  
Dates.....

Decision & Action.....

.....

v) Any other Action! : .....

Dates.....

Nature of Action.....

.....

13. WHAT IN YOUR VIEW IS THE CURRENT OVERALL IMPACT OF THE MUNICIPAL COUNCIL SOLID WASTE DISPOSAL SYSTEM IN GARISSA?

.....

.....

14. SUGGEST IMPROVEMENTS YOU WOULD WISH TO SEE IMPLEMENTED IN THE AREA OF GARBAGE MANAGEMENT IN GARISSA.

Improvement (1) .....

By Which Agency.....

Improvement (2) : .....

By Which Agency.....

Improvement (3) : .....

By Which Agency.....

Improvement (4) : .....

By Which Agency.....

**THANK YOU FOR YOUR TIME & CO-OPERATION**

APPENDIX 3 :

QUESTIONNAIRE FOR GARISSA MUNICIPAL COUNCIL RECORDS SECTION

Dear Sir/Madam

*We are undertaking a research under the auspices of the University of Nairobi with a view to generating recommendations for improvement of Solid Waste Management within Garissa Municipality. We anticipate our findings will be duly ploughed back via the relevant Government Departments towards a better living environment for all in Garissa Municipality.*

*Consequently you are requested to answer the following brief questions as accurately as you can and attach relevant documents wherever possible.*

- *The exercise will only take ten minutes.*
- Name of Respondent .....
- Section.....
- Designation.....

1) Give and /or attach a brief history of the town including names, years and milestones.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

2) Give and/or attach a brief history of Garissa Municipal Council including names, years and miles

.....  
.....  
.....

3) Outline the positions and names of current administrative areas under the Provincial Administration (ie Divisions, Locations, Sub-locations), Use attached map)

.....  
.....

.....  
.....  
.....  
.....

4) Outline the location and names of currently electoral areas under the Interim Electoral Commission (ie Wards; Use attached Map)

.....  
.....  
.....  
.....  
.....

5) Outline the current zoning distribution (if any) in the town (ie Residential, Industrial, Commercial, Public Utility, Public Purpose etc) use attached map.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

6) Outline the position and names of current Residential areas (use attached map)

.....  
.....  
.....  
.....  
.....

7) Give a history of development of the residential areas and their current population distribution.....

.....  
.....  
.....  
.....

8) What is Overall Population of the Town?

.....  
.....  
.....

.....  
.....

9) What is the structure and organization of the Garissa Municipal Council with respect to Departments and sections from Clerk down to solid waste section? Kindly illustrate in a chart similar to the as the one below:

10) Outline the long term future plans of the Council with respect to residential areas?

.....  
.....  
.....  
.....  
.....  
.....

11) Kindly furnish us with copies of relevant documents and maps to reinforce the answers above?

**THANK YOU FOR YOUR TIME & CO-OPERATION**

**APPENDIX 4 :**

**QUESTIONNAIRE FOR GARISSA MUNICIPAL COUNCIL SOLID WASTE SECTION**

Dear Sir/Madam

*We are undertaking a research under the auspices of the University of Nairobi with a view to generating recommendations for improvement of Solid Waste Management within Garissa Municipality. We anticipate our findings will be duly ploughed back via the relevant Government Departments towards a better living environment for all in Garissa Municipality.*

*Consequently you are requested to answer the following brief questions as accurately as you can and attach relevant documents wherever possible.*

- *The exercise will only take ten minutes.*
- *Name of Respondent .....*
- *Section.....*

*Designation.....*

1) What is the brief history and milestones of the Solid Waste Department?.....

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.....

2) Describe the Organization of the Solid Waste Management Division down to cleansing section in a flow chart like the one below?

.....

.....

.....

.....

.....

3) Give a breakdown of your current and desired staff strength over recent financial years as follows:-

4)

F/Y		NUMBER OF WORKS IN:							
		FY 05/06		FY 06/07		FY 07/08		FY08/09	
		Current	Needed	Current	Needed	Current	Needed	Current	Needed
STAFF									
Sweepers									
Loaders									
Subordinate staff									
Staff									
Overseers									
Head department									
OTHERS (Please specify)	1.....								
	2.....								
	3.....								
	4.....								
	5.....								

5) What is your recommendations on staffing?.....

.....  
 .....

6) Briefly outline the current mode of solid waste management under the following subheadings currently being undertaken by council.

i. Waste Collection:...

.....  
 .....

ii. Waste Storage

.....  
 .....

iii. Waste Transportation:

.....  
 .....

iv. Waste Disposal& where;

.....  
 .....



.....  
 .....

7) With respect to Waste Management Equipment; list the desired and available pieces of equipment as per the table below?

EQUIPMENT	REQUIRED	AVAILABLE	CONDITIONS OF EQUIPMENT (TICK ONE)				
			UN-SERVICEABLE	FAIR	AVERAGE	GOOD	BRAND NEW
Brooms Shovels Wheelbarrows Protection Gear (per person) Pallets Multilifts Compactors Minimatics Tipper Covered refuse motor - vehicles Trailer - tractors							
Others	1.....						
	2.....						
	3.....						
	4.....						
	5.....						

8) Outline the levels of Garbage in tones collected over recent Financial Years.

Type of Waste	Amounts (tonnes) F/Y 05/06	Amounts (tonnes) F/Y 06/07	Amounts (tonnes) F/Y 07/08	Amounts (tonnes) F/Y 08/09
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

9) Any hazardous waste, type and amount I Garissa? (eg Chemical Radioactive Wastes etc)

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...  
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...  
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....

10) Any additional mitigation measures by GMC against adverse effects of waste on environment and health?.....

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11) Are there any solid waste storage receptacles issued to residents and if so how many per week?.....

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.....  
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.....

If not have they ever been issued in the past? What type & size , Which Year? Why the stoppage? By Who?.....

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.....  
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.....

12) Are there any specific official requirements made by GMC to residents on solid waste procedures? Give details on:-

i. Type of Garbage Container & Size.....

.....  
.....

ii. Days of refuse collection from residents

.....  
.....  
.....

iii. Mode of collection (ie roadside or doorway)

.....  
 .....  
 .....

iv. Separation of Garbage into different types before putting out

.....  
 .....  
 .....

v. Any other requirements?.

.....  
 .....

13) Do you charge residents a cess fee for garbage collection and if so how much (per household per week)?

.....  
 .....

14) Is there a fixed rhythm for waste collection by council vehicles (eg;

a) No of times a week?

.....

b) Which streets and which days?

c) .....

15) On the issue of steel and masonry constructed garbage, Kindly supply information on their distribution as follows and mark on attached map.

Item	Name of Street of Junction of street	Type / Model of container	Size (Cubic metres)	How many	How many more needed
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

16) Briefly describe the current operations, if any at the Municipal landfill (eg dumping, scavenging, spreading, watering, compacting etc) and how often they happen?

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17) Give an inventory of the GMC waste landfills as follows:-

LAND FILL	LOCATION	SIZE SQ METRE	DISTANCE FROM TOWN HALL (KM)	STATUS/ CONDITIONS
NO.1				
NO.2				
NO.3				
NO.4				

18) Kindly supply any background literature, maps, photos & diagrams to support the above comments.....

THANK YOU FOR YOUR TIME & CO-OPERATION

**APPENDIX 5 :**

**QUESTIONNAIRE FOR GARISSA MUNICIPAL COUNCIL ACCOUNTS/  
FINANCES SECTION**

Dear Sir/Madam,

*We are undertaking a research under the auspices of the University of Nairobi with a view to generating recommendations for improvement of Solid Waste Management within Garissa Municipality. We anticipate our findings will be duly ploughed back via the relevant Government Departments towards a better living environment for all in Garissa Municipality.*

*Consequently you are requested to answer the following brief questions as accurately as you can and attach relevant documents wherever possible.*

- *The exercise will only take ten minutes.*
- Name of Respondent .....
- Section.....
- Designation.....

1. Briefly summarize the LA&DAP Action Plans drawn up by GMC over successive years
  - i FY 2005/06.....
  - ii FY 2006/07.....
  - iii FY 2007/08.....
  - iv FY 2008/09.....
  
2. Briefly outline overall budgetary allocations by GOK to GMC and the part of the budget allocated to Solid Waste Management in Garissa?

	GOK Funding	Solid Waste Components (Ksh)	Funding from Other Sources	Revenue from Solid Waste (Kshs.)	Totals (Kshs)
FY 2005/06					
FY 2006/07					
FY 2007/08					
FY 2008/09					
Average of Total per Year					

3. Recommendations by GMC on enhancing the Budgetary allocations for Solid Waste Management.....  
.....  
.....

4. Kindly furnish copies of any available documents and records to support the information above.....  
.....  
.....

**THANK YOU FOR YOUR TIME & CO-OPERATION**

**APPENDIX 6 :**

**QUESTIONNAIRE FOR KENYA NATIONAL BUREAU OF STATISTICS, GARISSA OFFICE**

Dear Sir/Madam

*We are undertaking a research under the auspices of the University of Nairobi with a view to generating recommendations for improvement of Solid Waste Management within Garissa Municipality. We anticipate our findings will be duly ploughed back via the relevant Government Departments towards a better living environment for all in Garissa Municipality.*

*Consequently you are requested to answer the following brief questions as accurately as you can and attach relevant documents wherever possible.*

- *The exercise will only take ten minutes.*
- Name of Respondent .....
- Section.....
- Designation.....

1) Give a summary of the Dadaab - Ife, District and Municipality population over recent years as follows?

Population Area	Population over the years							
	2002	2003	2004	2005	2006	2007	2008	2009
Garissa District								
Garissa Municipality								
Satellite towns (Dadaab-Ife etc)								

2) Give a breakdown of current population in Garissa town by wards if possible?

Ward	1	2	3	4	5	6	7	8
Population								

3) What are the future projected demographic trends in years to come?..

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.....  
.....  
.....  
.....  
.....

4) Outline the social statistics in groupings and ethnic patterns?.....

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5) Outline the Employment statistics in various sectors of the economy of the Municipality and / or District.

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.....  
.....  
.....  
.....  
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6) Outline the unemployment statistics?.....

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.....



7) Indicate Income levels in households within the Municipality and / or District.

Average	
Maximum	
Minimum	

8) Furnish with documents to reinforce the details above.

9) Also kindly provide any additional information you feel may be relevant to this research.

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**THANK YOU FOR YOUR TIME & CO-OPERATION**

**APPENDIX 7 :**

**QUESTIONNAIRE FOR PUBLIC HEALTH OFFICE**

Dear Sir/Madam

*We are undertaking a research under the auspices of the University of Nairobi with a view to generating recommendations for improvement of Solid Waste Management within Garissa Municipality. We anticipate our findings will be duly ploughed back via the relevant Government Departments towards a better living environment for all in Garissa Municipality.*

*Consequently you are requested to answer the following brief questions as accurately as you can and attach relevant documents wherever possible.*

- *The exercise will only take ten minutes.*
- *Name of Respondent .....*
- *Section.....*
- *Designation.....*

1. Give us a summary of medical records on prevalence in Garissa municipality over the past five years of the following diseases:

- a) Malaria.....
- b) Bilharzia.....
- c) Tape worms.....
- d) Cholera.....
- e) Respiratory tract infections.....

Give documentary records for the prevalence above.

2. In your view are such prevalence rates attributable to remnant Solid Waste menace in the Municipality. Give details and copies support documents and /or research finding where possible

.....  
.....  
.....

3. What is your projected long term prognosis in for such environment as Garissa Municipality if the Solid waste menace persists unchecked?.....

.....  
.....

**THANK YOU FOR YOUR TIME & CO-OPERATION**

**APPENDIX 8 :**

## EXERPTS OF THE EXISTING LEGISLATION ON SWM IN KENYA.

**The Public Health Act Cap 242;**

**Sec10(2);**

“...The Functions of Medical Department shall be..... to prevent and guard against the introduction of infectious diseases into Kenya from outside, to promote Public Health.....to advise and direct local authorities in regard to matters affecting Public Health...”

**Sec 15;**

“.....The Minister for Local Government shall, before approving any by-law made by a Municipal Council affecting Public Health, obtain agreement of the Minister for the time being responsible for health.....”

**Sec116;**

“..... It shall be the duty of every Local Authority to take all lawful necessary and reasonably practical measures for maintaining its district at all times in clean and sanitary conditions.....and for...remedying.....any nuisance or condition liable to be injurious or dangerous to health.....”

**Sec 118(1) (c );**

“.....defines a nuisance as amongst others.....”any ditch, gutter,.....sink....waste pipe, drain, sewer, garbage receptacle dustbin, ding pit, refuse pit, slop-tank, ash-pit or manure heap so foul or.....so situated or constructed as in..... to be offensive or injurious...to health....”

“.....any accumulation or deposit of refuse, offal, manure or other matter whatsoever which is offensive or injurious... to health.....”

“.....any act, omission or thing which is or may be dangerous to life or injurious to health.....”

**The Environment Management & Co-ordination Act (1999); Sec 87;**

- (1) “.....No person shall discharge or dispose of dry waste.....in Kenya...in such a manner as to cause pollution to the environment or ill health to any person.
- (2) “.....No person shall operate a waste disposal site or plant without a license from the Authority (NEMA).....”
- (3) “.....Every person whose activities generate wastes shall employ measures essential to minimize wastes through treatment, reclamation & recycling.....”

**The Local Government Adoptive By-Laws**

**Sec 238 (2)**

“..... no person shall erect a hoarding or scaffolding on or over any street without first obtaining a licence from the council .....”

**Section 239 (1)**

“ ..... any person who, except with the prior consent of the council, deposits or causes or permits to be deposited any builders materials builders plant or builders debris upon any street, shall be guilty of an offence....”

**Section 239 (2)**

“..... the council will without prejudice to its right to take –proceedings in respect of such contravention I shall have power to remove the same and man if, it thinks fit, sell such materials plpan or debris.....”

**Section 239(3)**

“..... any expense incurred by the council in removing any materials plants or debris ..... Shall be recoverable as a civil debt from the person who deposited such materials .....”

**Section 239 (4)**

The owner or contractor shall on completion of the demolition ensure that materials and debris is not forming part of any other structure, are removed from the site and that the site is left in a clean and tidy condition .....” “