GENERATION AND MANAGEMENT OF SOLID AND LIQUID WASTES IN THE JUA KALI SECTOR: A CASE STUDY OF METAL WORK AND MOTOR VEHICLE JUA KALI ENTERPRISES IN KAMUKUNJI AND ZIWANI AREAS OF NAIROBI, KENYA

BY

WANYAMA TOM

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF A MASTER OF ARTS [SOCIOLOGY] DEGREE OF KENYATTA UNIVERSITY
DECLARATION

THIS THESIS IS MY ORIGINAL WORK AND HAS NOT BEEN PRESENTED FOR A DEGREE IN ANY OTHER UNIVERSITY

WANYAMA TOM

THIS THESIS HAS BEEN SUBMITTED WITH OUR APPROVAL AS UNIVERSITY SUPERVISORS.

DR. REGINA M. KAREGA
DIRECTOR, BUREAU OF EDUCATIONAL RESEARCH AND
LECTURER, SOCIOLOGY DEPARTMENT

MR. ABEL M. OSEBE
LECTURER, GEOGRAPHY DEPARTMENT
DEDICATION

I dedicate this work to my caring parents, Mr. Onondo Odiemo and Mrs. Christine Achieng whose material and moral support enabled me get this far, my beloved wife Elizabeth for standing by me throughout the course, and our children Sarah and Eugene for withstanding all the inconveniences.
ACKNOWLEDGEMENTS

Work of this magnitude cannot, by any degree of imagination, be the product of one man's efforts. Many hands and minds had stake in its preparation and to them all I owe the success. However, since any attempt to name all of them here would mean producing yet another volume probably bigger than this, I have the pleasure of according special credit to just a few, the contribution of the rest notwithstanding.

At the helm of it all is the Almighty God by whose grace I enjoyed abundant life, energy and peace throughout the course. To Him I am greatly indebted. Next are my supervisors; Dr. Regina Karega and Mr. Abel Osebe whose brilliance and diligence in guiding me cannot be gainsaid. The keenness with which they read the manuscripts and the professionalism with which they made their comments and gave directions, calls for particular mentioning. It is with great admiration that I extend my hand of gratitude to them.

Thanks also to all those members of Sociology Department and the Faculty of Arts, Postgraduate Studies Committees who, despite their busy schedules, attended my presentations. Indeed, the current state of this work should be testimony enough as to the quality of their exemplary contributions and advice.
Equally important to mention is the material, ideological and moral support I enjoyed from Mr. Wellington Amkaya and Vincent Were. As best friends and colleagues, they always came in handy whenever I needed help. This, combined with the hospitality and co-operation of the officials and members of both Kamukunji and Ziwni Jua Kali Associations made it possible for me to accomplish my mission. Consequently, let them all share my word of thanks.

Last but not least, I wish to thank Mrs. Carol Runyenje of Kenyatta University for affording me cost-effective and high quality typing services. May God bless her industrious hands, for without her, the completion of this work could have been an uphill task.

Finally, let my heartfelt appreciation go to my wife Elizabeth and our children Sarah and Eugene for their understanding, patience and moral support in the course of my pursuance of the study. It made me feel strong and determined.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaration</td>
<td>i</td>
</tr>
<tr>
<td>Dedication</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>iii</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>v</td>
</tr>
<tr>
<td>List of Tables</td>
<td>xi</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xiii</td>
</tr>
<tr>
<td>Abbreviations and Symbols</td>
<td>xiv</td>
</tr>
<tr>
<td>Abstract</td>
<td>xv</td>
</tr>
<tr>
<td>Chapter One</td>
<td>1</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Background to the Study</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the Research Problem</td>
<td>3</td>
</tr>
<tr>
<td>Research Questions</td>
<td>5</td>
</tr>
<tr>
<td>Objectives of the Study</td>
<td>5</td>
</tr>
<tr>
<td>Justification and Significance of the Study</td>
<td>7</td>
</tr>
<tr>
<td>Scope and Limitations of the Study</td>
<td>8</td>
</tr>
<tr>
<td>Operational Definition of Concepts</td>
<td>9</td>
</tr>
<tr>
<td>Organization of Subsequent Chapters</td>
<td>12</td>
</tr>
</tbody>
</table>
Chapter Three ................................................................. 55

Study site and Methodology .............................................. 55

• Introduction ........................................................................ 55
• Study Site .......................................................................... 55
• Location and Climate of Nairobi ........................................ 57
• Research Design .................................................................. 58

➢ Types and Sources of Data .................................................. 58
➢ Primary Data Collection Techniques .................................... 59
➢ Target Population and Sampling Frame .............................. 60
➢ Sample Size and Sampling Procedure ............................... 61
➢ Data Processing and Analysis ............................................ 61
➢ Definition of Variables used in the Study .......................... 65
  Independent Variables ....................................................... 65
  Dependent Variable .......................................................... 66
  Extraneous Variables ......................................................... 66
➢ Summary ............................................................................ 67
Chapter Four

- Socio-Demographic characteristics of the Artisans
  - Introduction
  - Age of Respondents
  - Distribution of Respondents by Sex
  - Formal Education Level
  - Experience of Working in the Sector
  - Summary

Chapter Five

- Types of waste Generated and Coping Mechanisms
  - Introduction
  - Waste Type and the Perceived Generation Level
  - Disposal Methods Used
  - Disposal Problems Experienced in the Metal and Motor Vehicle Jua Kali Sub-sectors

Chapter Six

- Environmental Awareness Issues Among the Artisans
  - Introduction
• Metal Work and Motor Vehicle Jua Kali Artisans Access to Informal Environmental Education................................................................. 89

• Respondents General Perception of the Impact of their Waste Disposal Habit on the Environment......................................................... 96

Summary........................................................................................................ 101

Chapter Seven .................................................................................................. 103

• Role of Government in Waste Management in the Metal Work and Motor Vehicle Jua Kali Subsector.................................................. 103

• Introduction.................................................................................................... 103

• Government Role in Waste Management.................................................. 103

• Summary........................................................................................................ 110

Chapter Eight.................................................................................................. 112

➢ Conclusions, Recommendations and Suggestions for Further Research..... 112

➢ Introduction .................................................................................................. 112

➢ Conclusions Drawn...................................................................................... 112

➢ Recommendations Made ........................................................................... 114

➢ General Recommendations......................................................................... 114

Improving Governance.................................................................................. 114

Choosing Appropriate Policy Instruments.................................................... 115

Mobilizing Popular Participation.................................................................... 116
Appendix Nine: Micro and Small Enterprise Training and Technology Project ........................................ 142
Appendix Ten: Training for Jua Kali - Micro and Small Enterprise Growth .................................................. 143
Appendix Eleven: Map 1 - City of Nairobi .................................................. 144
Appendix Twelve: Map 2 - Informal Sector Main Operation Areas - Nairobi .................................................. 145
List of Tables

Table 5.1: Types of Waste Generated................................................................. 76

Tables 5.2a & 5.2b: Chi-square ($\chi^2$) Values for the Methods of Waste Disposal used.............................................................................................. 81

Tables 5.3a & 5.3b: Chi-Square ($\chi^2$) Values for Disposal Problems Experienced.............................................................................................. 85

Tables 6.1a & 6.1b: Chi-Square ($\chi^2$) Values for General Hearing about Informal Environmental Education......................................................... 91

Tables 6.2a & 6.2b: Chi-square ($\chi^2$) Values for Benefits of Environmental Education.............................................................................................. 95

Tables 6.3a & 6.3b: Chi-square ($\chi^2$) Values for Effects of the Disposal Methods Used (save for selling)................................................................. 96

Tables 6.4a & 6.4b: Chi-square ($\chi^2$) Values for Remedial Measures to the problem of Environmental Pollution by Wastes from Jua Kali Sector................................................................. 100

Tables 7.1a & 7.2b: Chi-Square ($\chi^2$) Values for Government Support................................................................. 105

Tables 7.2a & 7.2b: Chi-square ($\chi^2$) Values for Preferred Assistance from the Government Regarding Waste Management................................................................. 109
### List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1:</td>
<td>The Ecological Complex</td>
<td>48</td>
</tr>
<tr>
<td>Figure 2:</td>
<td>Conceptual Model</td>
<td>52</td>
</tr>
<tr>
<td>Figure 3:</td>
<td>Respondent's Age</td>
<td>69</td>
</tr>
<tr>
<td>Figure 4:</td>
<td>Respondent's Formal Education Level</td>
<td>71</td>
</tr>
<tr>
<td>Figure 5:</td>
<td>Experience in the Sector</td>
<td>73</td>
</tr>
<tr>
<td>Figure 6:</td>
<td>Perceived Level of Waste Generation in the Sub-Sectors</td>
<td>77</td>
</tr>
<tr>
<td>Figure 7:</td>
<td>Commonly Used Disposal Methods</td>
<td>79</td>
</tr>
<tr>
<td>Figure 8:</td>
<td>Disposal Problems Experienced by the Respondents</td>
<td>84</td>
</tr>
<tr>
<td>Figures 9(a) &amp; (b):</td>
<td>Forms of Media Through which Environmental Information was Gathered</td>
<td>90</td>
</tr>
<tr>
<td>Figure 10:</td>
<td>Perceived Benefits of Environmental Education</td>
<td>93</td>
</tr>
<tr>
<td>Figure 11:</td>
<td>Remedial Measures to the Problem of Environmental Pollution by Wastes from the Jua Kali Sector</td>
<td>98</td>
</tr>
<tr>
<td>Figure 12:</td>
<td>Government Support for the Artisans</td>
<td>104</td>
</tr>
<tr>
<td>Figure 13:</td>
<td>Preferred Assistance from the Government Regarding Waste Management</td>
<td>107</td>
</tr>
</tbody>
</table>
Abbreviations and Symbols

EARC: East Africa Royal Commission

GPD: Gross Domestic Product

ILO: International Labour Organization

IEA: Institute of Economic Affairs

NGO: Non-Governmental Organization

U.K.: United Kingdom

UNDP: United Nations Development Programme

U.S.: United States

WCED: World Commission on Environment and Development

$X^2_c$: Calculated Value of Chi-square

$X^2_T$: Critical (Table) Value of Chi-square
ABSTRACT

The study was carried out in the City of Nairobi, among metal workers and motor vehicle repairers who are registered as members of Kamukunji and Ziware Jua Kali associations. The study's objectives were:

1. to find out types of wastes generated by the metal work and motor vehicle Jua Kali sub-sectors and determine the artisans perception of the generation level;
2. to determine the way these wastes are disposed of and examine the environmental, quality implications of the waste disposal techniques used;
3. to determine the degree of awareness among metal work and motor vehicle Jua Kali artisans regarding the impact of the waste disposal habits on the environment;
4. to assess the problems the artisans experience in waste disposal and how they deal with the problems, and
5. to analyse the role of the government in ensuring proper waste disposal by the metal work and motor vehicle Jua Kali artisans.

A total sample of 79 artisans was drawn for the study. The sampling procedure involved both simple random and systematic random sampling. Simple random sampling was used to identify starting points while systematic sampling was used to pick the subsequent (10-th) units of analysis.

Both quantitative and qualitative methods of data collection were used. In particular, structured interview schedules were used to collect quantifiable information from the artisans, while unstructured interviews with the officials of the Jua Kali associations and the City Council, and non-participant observation were used in the collection of qualitative data.

Quantitative data was processed into frequencies and percentages that facilitated generation of figures and tables. The figures and tables were then used to explain the findings in relation to the study's questions and objectives. To determine the 'Goodness of Fit' of the results, a chi-square ($\chi^2$) test was utilized.

In brief, the key findings of the study were that a considerable variety of wastes are generated in the Jua Kali sector. These include: Wornout metal parts/metal cut-offs, plastic containers, rubber pieces, waste cleansing materials (e.g. rugs, sawdust, waste rinse water/waste water, soil, among others), grease, oils, acids, tar, paint, soap chemicals, paper products, smashed glass, leather pieces, oil filters and battery shells. The level of generation was rated as high by the artisans.

The methods used to manage and dispose the stated wastes mainly include burning and open dumping. This implies that the manner of waste disposal currently in place in the Jua Kali sector enhances environmental degradation rather than guard against or reduce the problem.
Although the artisans were aware of the kind of impact the used disposal methods have on the environment, they noted that they lack support that could enable them put into use the appropriate waste management strategies.

The leading problems the artisans encounter in the process of managing the wastes include lack of storage facilities, transport, disposal sites within proximity, and support from the City Council. Consequently, the only alternative that they are left with is burning and/or open dumping the wastes.

The study further established that the government is not involved in waste management by the metal work and motor vehicle Jua Kali sector. It has concentrated more on the provision of land and construction of sheds for use by the artisans without necessarily giving guidance and material support in the management of wastes from these sub-sectors. No programmes exist that are aimed at training of and awareness creation among the artisans in regard to waste management.

Thus, from the study's findings, it is concluded that there is need for serious attention to be paid to the issue of waste management in the metal work and motor vehicle Jua Kali sector, and generally recommended that the artisans be provided with material support and empowerment through informal environment education to enable the sector be ideally a source of sustainable development.
CHAPTER ONE

1.1 INTRODUCTION

This chapter discusses the background issues to the study. It states in brief the environmental experiences of the cities, the place and growth of the informal sector, and why it is of interest to the current study. The chapter also states the research problem, the research questions that guided the study, and the specific objectives that the study set out to achieve. The chapter further discusses the justification and significance of the study, scope and limitations of the study, operational definition of terms and concepts, and organization of the subsequent chapters presented in the thesis.

1.2 BACKGROUND TO THE STUDY

According to the World Bank [1991], cities are widely perceived as the locus of productive activities throughout the world. However, they continue to face numerous environmental problems occasioned particularly by the process of industrialization. One of their major environmental problems today is the management of waste. The phenomenon has been compounded by increased generation of waste from small scale and cottage industries [World Bank, 1994]. Incidentally, the growth of these industries (Jua Kali) in Kenya has been supported as a major industrialization strategy.
One example of government support for this sector was the International Development Association's (IDA) sponsored training programme for the micro and small scale enterprises sector advertised in 1999. In this case, the government, through the Directorate of Applied Technology was supposed to play a facilitative and co-ordinating role. The training was aimed at improving productivity and enhance organizational skills in the Jua Kali sector [see appendices nine and ten].

However, the abounding question is whether this training, which aimed at enhancing development, incorporated environmental awareness. As Ondiege [1995] observes, development will not only lead to GDP growth rates and welfare improvement but can also, unless checked, have disastrous effects on the environment. Thus according to Reed [1996:83];

"Efforts to industrialise economies must include consideration of the environmental implications. Environmental institutions must be maintained during the adjustment process to prevent environmental degradation that have both short-term and long-term consequences for development".

It has therefore become quite demanding for countries like Kenya in their endeavour to promote the growth and sustainability of the informal sector since they are specifically required to meet the goals set up in their development plans and at the same time abide by the standard requirement of sustainable development. This has not been easy because Kenya, like other industrializing countries has tended to overlook the significance of environmental regulations while drawing up policies and programmes aimed at promoting and sustaining the informal
sector [Bromley, 1979; Maser, 1979].

As a matter of fact, in Kenya, despite spirited campaigns to popularize and promote the growth of the Jua Kali sector, there has been no proper provisions, as far as waste management is concerned [Ogutu, 1996]. Consequently, it remains a matter of debate as to how waste from this sector is handled. Past studies in the informal sector such as EARC 1955, ILO 1972, McCormik 1994, Macharia 1995, and King 1996 have concentrated on examining and analysing the technological dynamics or entrepreneurial experiences of the artisans/traders. Those which have touched on the issues of waste in the sector such as Otieno 1992, Lamba 1994, and Ogutu 1996 remain scanty. It is against this background that this study set out to investigate generation and management of solid and liquid wastes in the Jua Kali sector with particular interests in the types of wastes generated and the commonly used disposal methods. Equally important to the study was the artisan’s participation in informal environmental education as well as the governments role in ensuring that waste generated in these sector is properly handled and disposed of.

1.3. STATEMENT OF THE RESEARCH PROBLEM

It is generally agreed that indiscriminate emission of gases and fumes into the atmosphere, improper storage, transportation and eventual disposal of liquid and solid wastes including hazardous wastes, has enormously polluted the environment. This has resulted in the emphasis on having those activities that pollute the environment identified in order to develop strategies
for managing their impact on the environment [Kenya, 1994].

In Kenya, the unplanned development of small scale enterprises [Jua Kali] is said to have increased discharge of pollutants into the environment. However, as mentioned earlier, most of the studies which have been carried out in the sector have concentrated much on the assessment of the techno-fiscal problems bedeviling the sector, while paying little regard to the problem of waste management.

Few of the studies which have focused on waste generation in the informal sector [Ruto, 1988; Otieno 1992; Lamba, 1994; Ogutu, 1996] have not examined the issue of waste management in the Jua Kali sector as one that requires particular attention. The studies have only mentioned Jua Kali sector as one of the sources of waste, without making it a priority to investigate how the said waste from the Jua Kali sector is managed and finally disposed. This apparent lack of focused environmental studies with strong interest in the intricacies of waste management in the Jua Kali sector erroneously present the sector as a non-entity in environmental sense.

This study attempts to fill the identified gap by examining the types of liquid and solid wastes generated in the metal work and motor vehicle Jua Kali sub-sectors, and the waste management experiences of the Jua Kali artisans in the two sub-sectors. The study further examines the role played by the government in the management of waste as well as the levels of awareness among the artisans with regard to waste management.
1.4. RESEARCH QUESTIONS

In the light of the foregoing, this study set out to address the following research questions:

1. What is the current state of waste management in the metal work and motor vehicle repair Jua Kali sub-sectors in Kenya? And of what environmental significance is this state of affairs?

2. Are there any waste management problems experienced by the metal workers and motor vehicle repairers? And if so, how do they deal with these problems?

3. Are there any set Government support programmes for waste management by the Jua Kali metal workers and motor vehicle repairers in Kenya, and if so, how have the programmes performed?

4. To what extent is environmental information accessible to the Jua Kali metal workers and motor vehicle repairers and how does this information impact on their perception and protection of the environment within which they operate?

1.5. OBJECTIVES OF THE STUDY

The study’s general objective was to examine generation and management of solid and liquid
wastes in the metal work and motor vehicle Jua Kali sub-sectors and give recommendations on how the existing situation can best be dealt with. This translated into a number of specific objectives which include:

[a] To examine and analyse the type of waste generated by metal and motor vehicle artisans in the Jua Kali sector in Ziwani and Kamukunji areas and determine their perception of the generation level,

[b] To examine the way in which these wastes are disposed of and analyse the environmental quality implications of the waste disposal techniques in use,

[c] To assess the problems experienced in waste disposal and how they are dealt with,

[d] To examine and analyse levels of awareness among metal work and motor vehicle Jua Kali artisans regarding ways of handling and disposal of wastes, and their knowledge of possible hazards related to the way waste is managed,

[e] To analyse the role played by the government in ensuring proper waste disposal by metal work and motor vehicle artisans in the Jua Kali sector.
1.6. JUSTIFICATION AND SIGNIFICANCE OF THE STUDY

This survey is in line with UNDP's, World Bank's and Habitat's programme on urban management whose aim is to understand the factors underlying urban problems and make suitable recommendations [World Bank, 1992], aimed at alleviating the problems which are mainly environmental in nature.

Nairobi was preferred for having a large and well established Jua Kali sector, particularly motor vehicle repair and metal work which are mainly located in Kamukunji and Ziwanj areas. These two sub-sectors have been found to be among the leading contributors to the problem of waste generation in the Jua Kali sector [Ogutu, 1996; Lamba, 1994; Kenya, 1994]. The findings of the study will therefore inform the government, non-governmental organisations and individuals interested in environmental issues about the manner in which metal work and motor vehicle Jua Kali sub-sectors contribute to the environmental problems facing the City of Nairobi.

Significantly, it is hoped that the findings of the study will guide the policy makers, planners and other concerned groups in coming up with accurate policies and projects that will harmonize Jua Kali activities with the required environmental standards. The benefits of this conscious planning will not only be environmental, but also economic in terms of spending less on trying to redeem an already degraded environment.
Academically, the findings will contribute to the existing body of knowledge in the field of environmental sociology, as well as, prompt further researches on Jua Kali and environment.

1.7. SCOPE AND LIMITATIONS OF THE STUDY

The study covered artisans operating in the City of Nairobi and in particular, those artisans dealing with motor vehicle repair and metal work, and were registered as members of Kamukunji and Ziwani Jua Kali associations. This was occasioned by limited time and financial resources which could not allow for the coverage of a larger scope. Besides, the concentration on solid and liquid wastes was a precaution against the technicalities of trying to establish the methods used in the disposal of gaseous wastes, and also because the gaseous wastes, through piloting, were found to be an outcome of the disposal of solid wastes.

Consequently, the study's findings are faced by a number of limitations which include the fact that:

[a] the results may not necessarily be representative of other towns or parts of the country given the possible spatial variations,

[b] it is difficult to generalize for those artisans who are not members of any association given the likely unique practise and experience, and
operational definition of terms and concepts

 awareness: awareness is having knowledge or consciousness about various environmental issues including waste management.

disposal: this is the act of getting rid of or removal of unwanted substances or material.

generation: this refers to the process of causing something to exist or get produced. in particular, it means the process of causing unwanted substances or material to come into existence.

environment: in the context of the study, the concept refers to the physical and social conditions in which people live, especially as they influence their feelings and development. the physical aspect includes the natural conditions such as air, water, and land in which people, animals, and plants live.

waste: this is unwanted material or substances resulting from the activities of metal
and motor vehicle Jua Kali artisans.

**Jua Kali:** Jua Kali are two Swahili words which mean 'hot sun'. But in the course of the 1980s, and perhaps a little earlier, it became synonymous with the informal sector artisans such as car mechanics and metal workers who were particularly noticeable for working under the hot sun because of the absence of premises. Gradually the term was extended to refer to any one in self-employment whether in the open air or in permanent premises [King 1996]. In the context of this study, the term refers to those business activities in the informal sector that use technical skills and know-how to manufacture goods, or use technical skills and knowhow in the provision of various services.

**Informal Sector:** The informal sector is mainly regarded as those microenterprises employing up to 10 persons and small enterprises that have between 11 and 50 employees [Ondiege, 1995]. The sector could be of three types: first, the sub-contracting type of enterprises which is said to be closely associated with large firms and supplies specific components of products to these large firms. Secondly, the local supplier type which is seen as having developed to meet the demand for goods and services in the local market that is within its periphery. Lastly, the type that relies on the local resources of the region in which the enterprise is located. In Kenya, the first category has been found not to be well-
developed. However, the second and last types are said to be the most common.

Management: In the context of the study, the term refers to skills and processes employed in handling wastes by the artisans right from the point they are generated to the time they are disposed of.

Empowerment: This refers to equipping the artisans with the ability to make appropriate decisions and solve their waste management problems. This can mainly be done through informal environmental education.

Stakeholder: According to World Bank [1994], stakeholders belong to one of three sets of actors: (a) representatives of individuals and groups in society who are adversely affected by urban environmental degradation as well as those who have an interest in urban environmental conditions; (b) those with expertise about one or more environmental problems that affect the city; and (c) those who have the power to make decisions that influence urban environmental quality (e.g. government officials at the municipal, regional and national levels, private and informal sector enterprises).

Informal Environmental Education: This refers to environmental education that is intended
to benefit people outside the formal education system. It is non-institutionalized and runs as a continuous process.

1.9.0 Organization of Subsequent Chapters

Chapter two of this thesis reviews relevant literature in the area of study and discusses the theoretical framework which guided the study. The literature review covers issues of Urbanization, Development and the Environment. In particular, the literature reviewed focuses on informal sector development, urban population and environment, the Brown Agenda, factors aggravating urban environmental problems, waste generation and disposal, environmental policy, legal, institutional and educational issues, and means of improving urban environment. In the theoretical framework, three major theoretical perspectives are discussed. These are: Functionalism, Human ecology theory and The Network/stakeholder approach. Also provided in chapter two is the conceptual model of a comprehensive approach to environmental management, which borrows from the three theoretical perspectives.

Chapter three discusses the study site and the research methodology, while chapter four discusses the socio-demographic characteristics of the artisans. Chapter five discusses and analyses findings regarding the current state of waste management among metal work and motor vehicle Jua Kali enterprises where as chapter six presents findings on environmental awareness among the artisans. Chapter seven covers the role of the government in the management of wastes from metal work and motor vehicle Jua Kali enterprises while chapter
eight presents conclusions, recommendations and suggestions for areas that deserve further research.
Most of them established policies that encouraged the modern manufacturing sector hoping to raise incomes, employment and improving welfare of their people. In Kenya for instance, the government strategy for industrialization and commerce soon after independence was geared towards the expansion of overall output. This strategy basically focused on large scale modern enterprises, the implicit assumption being that only large scale enterprises in the formal sector contributed to economic growth [Ondiege 1995]. According to King [1996: xiii]:

"Not only was the informal sector not subsidized in any way but traditionally (had) either been neglected or even actively harassed by the national government or the municipal authorities".

However, in recent years, many economies have come to realize the importance of the informal sector in promoting income and employment generation especially so in the Third World countries [Ondiege, 1995]. In the middle of the 1980's for instance, the sector is said to have accounted for about 20% of the total output and over 20% of the total labour force in many African economies [World Bank 1989]. Estimates by International Labour Organization [ILO] indicate that the informal sector accounts for 59% of sub-Saharan Africa's urban labour force [Ondiege, 1995].

In Kenya, two very important elements that form the pre-history of the development of the informal sector are the East Africa Royal Commission (EARC) of 1953-1955 and the report of the 1966 Kericho Conference [King 1996]. The EARC is particularly considered very important to the entire East African region as it is said to have addressed one of the issues that was later on, so frequently, considered as an obstacle to informal sector development. The
commission drew up a powerful indictment of the restrictions and regulations that affected so many areas of colonial African life. The indictment covered the issue of marketing, provision of credit and licences, and the use and sale of land. More importantly, the EARC noted that the clusters of settlements just outside the boundaries of all the main towns in the region were very important as centres of African trade. Referring to African traders, EARC [1955:208] argued that:

"Their activities are on a very small scale and, lacking security of tenure, (and), they have no incentive to improve their premises. Yet to clear these areas of their inhabitants would be to destroy what in some urban areas, constitutes the only development of African commercial enterprise".

Thus, the EARC (1955) was very emphatic on the need to safeguard anything that epitomised African initiative and tendency towards trade and industry. The EARC was latter followed by a major conference which was held in Kericho in 1966 forming the second milestone in the development of the informal sector. This is said to have come as a result of the growing awareness of the scale of Kenya's primary school leaver crisis and what was conceived of as the stark arithmetic of unemployment that faced the dramatically rising numbers of young people [King 1996:5]. The conference thus viewed the informal sector as a convenient sponge for surplus labour.

This early increase of interest in the informal sector prompted the ILO to send the Comprehensive Employment Strategy Mission to Kenya in 1971. The Mission clearly established and put into perspective the Kenyan informal sector. These efforts were

The ILO's [1972] analysis of the informal sector observed that most of those outside the modern sector were actually also working. It emphasized that they were not only working very hard, but doing so with resources they had saved on their own, with labour-intensive and adopted technologies, with skills acquired outside the formal systems, and above all, it seemed relatively easy to enter this mode of work, even though it was clearly unregulated and highly competitive.

Concurring with EARC, ILO [1972] advised the government to abandon the shanty demolition and harassment policies and substitute them with site-and-service schemes, and greater security of tenure. The Mission also recommended that the trade licensing system be simplified and suggested that there should be much closer ties (networking) between formal and informal sectors through sub-contracting. It is in the spirit of this ILO's suggestion that the government, in its Sessional Paper No. 1 of 1986, promised to issue new regulations on tendering to require central ministries and district authorities to favour small-scale enterprises, [Kenya, 1986:56].

However, real change in the Kenya Government's view of the informal sector came in 1985. The government introduced major restructuring of the education and training systems, putting greater emphasis on vocational, scientific and technological development. At the same time the President made an unprecedented move of visiting both Kamukunji and Ziwani areas in
late 1985 and early 1986. During the visits, the President had suggested that sheds would be provided free by the government. He further urged the Jua Kali artisans to organize themselves into sizeable groups in order that they could be more easily helped by the government [King, 1996]. The response was the formation of Jua Kali associations.

These events of the late 1985 and early 1986 indeed put the informal sector right at the centre of the 1986 Sessional Paper No.1 which addressed Economic Management for Renewed Growth. The informal sector was treated as a main actor in the country's economic growth and particularly in creating jobs at low cost. In the said sessional paper, the government insisted that:

"the modern, urban, industrial sector cannot be depended on to employ much of the growing work force. To employ people on small farms, in very small-scale industry and services, or self-employment takes only a fraction of the 16,000 pounds per worker required in the modern sector. Clearly, the bulk of the work force will have to be productively employed in these activities" [Kenya, 1986:2].

A proposal was thus made to establish a task force to review all policies for the purpose of promoting the informal sector. The main aim of the task force was to recommend ways of creating a conducive regulatory environment for informal sector activities [Kenya 1986].

Consequently in 1989, a strategy was established whose scope covered three main domains: the first of these looked at what was called the enabling environment. This examined many of the micro-economic, legal, technological and fiscal obstacles to small enterprise. Central
to this part of the strategy was the proposition that the role of government should be changed from being interventionist to being facilitative of efforts by the private sector itself [King, 1996].

The second part of the strategy focussed on the need for the development of an enterprise culture. Recommendations were made which, sought to ensure that students at all educational/training levels in Kenya received instruction with content relating to self-employment and entrepreneurship [Kenya, 1989a]. It was emphasised that formal training programmes be designed to take care of the special training needs of the informal sector. This was to particularly focus on entrepreneurship skills [Kenya 1989b].

The third element was concerned mainly with many obstacles to credit experienced by the small and micro-enterprise sectors. Shifts in collateral policies, and change in bank incentives to lend to small-scale enterprises, were among the proposals made. The entire strategy culminated into Kenya's first Sessional Paper on Small Enterprise and Jua Kali Development in Kenya [Kenya, 1992]. This move spurred a lot of official interest in the Jua Kali sector.

The interest and publicity has since put sites like Kamukunji, Ziwani and Gikomba on the Map for those who had no knowledge of the places. As King [1996:28] puts it:

"in 1989 and early 1990, it was not uncommon to see groups of official visitors being conducted around some of the Jua Kali sites of Nairobi, to be shown illustrations of Kenya's dynamic micro-enterprise economy, almost as if the Government had been responsible for creating it".

Continued official involvement in the Jua Kali sector has thus prompted tremendous growth
in the sector countrywide. Available data on Kenya's Jua Kali sector today indicate that outside agriculture and the public sector, employment opportunities in the informal sector outweigh those in the formal wage sector in industry and commerce. In 1994, the sector was estimated to have 910,455 establishments employing a total of about 2,050,844 persons in the country. Commerce, manufacturing and service sectors accounted for 60.6%, 26.9% and 12.5% of the total establishments and 52.8%, 29.5% and 17.7% of total employment respectively [Parker and Torres, 1994].

Thus, this sector, which has majority of the poor participating as entrepreneurs, employees and customers plays an important role in production, distribution, finance and employment creation in the African economies and needs, therefore, to be given serious consideration to help reform Africa's economic structure [Ondiege, 1992]. This however must take into account the need for environmental protection. It is unfortunate that the task force stated above did not put into consideration issues of waste management in the sector.

What the sector requires most in Kenya is appropriate technology that makes use of available resources in order to achieve sustainable economic growth in the best and efficient way possible; secures wide and equitable participation in growth process; and enables the people to satisfy their basic needs while protecting the environment. By assessing management of solid and liquid wastes in the sector, this study was attempting to establish the extend to which the technology in the sector is appropriate in enabling the people to satisfy their basic needs while protecting the environment.
2.3. URBANIZATION, DEVELOPMENT AND THE ENVIRONMENT

Conserving the urban environment is fast becoming a necessity rather than a luxury. Rapid urbanisation particularly in the developing world is threatening health, the environment, and urban productivity. Cities are regarded as the powerhouse of economic growth, with 80% of Gross Domestic Produce (GDP) growth in developing countries expected to come from cities in this decade. But, the environmental implications of such growth needs to be assessed and managed better [World Bank, 1994].

According to World Health Organisation [WHO (1991)], the consequences of urbanization make a major contribution to the global environmental changes that threaten the very existence of life in the future. Health impacts of urban pollution that derive from inadequate water, sanitation drainage and solid waste services, poor urban and industrial waste management, and air pollution, especially from particulates are considered the critical and most immediate problems facing developing country cities [World Bank, 1994].

It is therefore important in the context of this study to review general literature on the issue of urbanisation and its impact on the environment. This is imperative since the study itself is an attempt at assessing the impact of a predominantly urban based economic/development activity on the environment. Moreover, the Jua Kali sector itself to a larger extent owes its current status to the dynamics of urbanization in Kenya, particularly the issue of urban population
growth and its implications for formal employment.

2.3.1 Urban Population, Development And The Environment

Cities are a driving force in development, but they are increasingly threatened by pollution, congestion, and environmental hazards resulting from unprecedented rates of rapid urban growth and industrialization in developing countries [World Bank 1994]. Consequently, reversing the deterioration of the urban environment without slowing economic development will require an environmental policy strategy that takes into account a wide range of stakeholders, difficult political and economic tradeoffs, and a complex set of natural, social, and economic relationships.

World Bank [1994] stresses that urgent action is needed because, as urban populations grow, so do environmental problems. From 1950 to 1980, the world's urban population almost tripled, increasing from 701 million to 1,983 million, or from 25% to 41% of the total world population. Since the rate of population growth in the industrialized countries declined over this period, most of the increase was in the cities of developing countries where urban population quadrupled, rising from 286 million in 1950 to 1300 million in 1985 [WHO 1991].

By 1991, WHO [1991] noted that the combined urban populations of developing countries were larger than those of Europe, Japan and North America taken together, while in 1994, World Bank [1994] observed that cities were absorbing two thirds of the total population.
increase throughout the developing world. By the turn of the century, it was expected that twenty-one cities in both developed and developing countries would have more than 10 million inhabitants and seventeen of those mega cities would be in developing countries [World Bank, 1992].

Generally, as WHO [1991] observes, annual increases in urban populations of more than 3% have been forecast for the developing countries over the next 40 years. Some projections assumed even faster rates of urban growth, leading to forecasts that these countries would have twice as many urban dwellers as developed countries by the turn of the century and four times as many by 2025. A major outcome of such alarming urban population increase is an equally rapid change in urban environment affecting the health of the inhabitants.

In particular, high rate of population growth brings with it increased demand for goods and services, necessitating the use of alternative means such as Jua Kali in Kenya to produce goods and render the scarce services. This is usually accompanied by increased waste generation and demand for appropriate disposal. Thus, without more effective interventions, such changes can cause serious environmental problems. It is in this context that this study was intended to contribute towards establishing effective interventions with regard to Jua Kali in Kenya.
2.3.2 The Brown Agenda

The Brown Agenda is a collective phrase used to refer to a set of urban environmental problems including: inadequate water, sanitation, drainage and solid waste services, poor urban and industrial waste management, and air pollution. This set of problems is said to be linked to development, income growth, and concern for green issues, including intergenerational concerns about global warming and natural resource depletion [World Bank 1994]. According to World Bank [1994], solving the brown issues in cities has crucial implications for resolving many natural resource or green issues that extend beyond urban boundaries. For instance, tackling urban air pollution and designing more energy efficient cities, can benefit more than one generation by reducing carbon dioxide emissions and thus slowing global warming.

As WHO [1992], and Pearce and Warford [1991] observe, brown problems in cities are very costly. Pearce and Warford [1991] estimate that pollution problems alone in some developing countries do exceed 5% of GDP, suggesting a total crisis. In specific terms, World Bank [1992], and USAID and US Environmental Protection Agency [1990] reported that in Bangkok, excessive exposure to lead causes 200,000 - 500,000 cases of hypertension, resulting in about 400 deaths a year. Rough estimates suggest that children with lead poisoning lose an average of four or more IQ points by the age of seven, with long-term implications for their productivity as adults.
Elsewhere, Eskeland [1991], Margulis [1992] and Schteingart [1989] note that in Mexico City, annual health costs from air pollution are estimated to exceed $1.5 billion. They argue that abnormally high levels of suspended particulates have caused an average of 2.4 lost work days per person each year and 6,400 deaths every year.

In the case of Jakarta, health costs associated with selected air pollutants (lead, suspended particulate matter, and nitrogen dioxide) are estimated to be $220 million a year. This includes the costs of avoidable deaths, restricted activity days, outpatient visits, hospital admissions, respiratory illness, hypertension cases, heart attack cases, asthma attacks, and loss of intelligence in children [World Bank 1993].

According to World Bank [1994], the brown agenda is bi-poled. At one end there are traditional environmental health problems associated with lack of adequate shelter and services, while at the other end are the environmental consequences associated with rapid industrialization without adequate hazardous waste management, air pollution control, occupational health services, industrial accident prevention, and other preventive programs.

Thus, coping with the brown agenda in urban areas in developing countries requires consideration of each city's unique set of environmental management issues. Of prime importance are the mutually reinforcing effects of poverty and environmental degradation. Other unique aspects would include the pace and intensity of urbanization, the cross-media and spatial implications of environmental degradation, urban land use and environmental inter-
relationships, and the wide range of public and private actors involved in causing as well as solving environmental problems [World Bank 1994].

In the context of Kenya, assessing issues of generation and management of solid and liquid wastes in the Jua Kali sector is thus an attempt at coping with the brown agenda in urban areas in Kenya. Jua Kali enterprises are indeed actors involved in the generation of wastes [Otieno 1992, Lamba 199, Ondiege 1996], and therefore they must be put into perspective while addressing urban environmental problems in Kenya.

2.3.3 Factors Aggravating Urban Environmental Degradation

To turn environmental degradation around, World Bank [1994] suggests the need to understand and specify the factors that perpetuate the lack of appropriate preventive and curative environmental actions. This suggestion is indeed the bottom line of the current study as it attempts to assess the issue of waste management in the Jua Kali sector.

According to World Bank [1994], one of the factors that perpetuate lack of appropriate environmental management is lack of public awareness of the environmental problems themselves and also low participation in efforts to improve the urban environment. In Kenya, this has been observed by many including Otieno, 1992, and Lamba 1994 among others. Regrettably, World Bank [1994] notes, it often takes an environmental disaster to stimulate profound change in many countries. This in most cases comes with high costs which could
have been avoided.

Moreover, in the absence of public pressure to improve environmental controls over particularly industry and other potentially polluting sectors such as Jua Kali, the easiest response one can expect from the government is inaction or disregard for environmental considerations. In making investment decisions, for instance, government policy makers typically consider direct economic benefits above all other considerations. That is why it is important to examine the case of Jua Kali in Kenya to establish the current trend.

Another impediment to industrial pollution control according to World Bank [1994] is that, many of the large-scale pollution-intensive industries are owned and managed by the state or by the politically powerful upper-income elite. Under these conditions, government officials have a difficult time summoning the political will needed to impose strict regulations, particularly when the targeted industries are viewed as vital to economic development. Such a situation may require environmental laws that are applicable to all and enforcing institutions that are strong enough to guard against abuse of and/or circumvention of the rules and regulation.

In most developing countries cities like Nairobi, metropolitan and municipal authorities lack the institutional capacity required to carry out effective environmental planning and management, and to routinely provide effective urban services. This basically amounts to inadequate governance and is sometimes compounded by poor coordination when public
responsibilities of different levels of government overlap. Further, the failure of most governments to provide adequate public education or include community and private sector participation in the design, planning and implementation of environmental services has often led to poor performance of initiated projects.

Insufficient knowledge of both the problems and the processes of environmental degradation has also been identified as a great hinderance to the capacity to plan. It has also made it difficult to implement responses to urban environmental problems, and hampered ability to build a political consensus [Ford Foundation 1993], needed to determine the way forward.

These problems are further compounded by the fact that acceptable analytical frameworks for understanding the problems, ranking them, and designing locally appropriate environmental protection programmes to resolve them are also lacking. For example, World Bank [1994] notes that most local authorities are usually unaware of the magnitude of ongoing environmental damage or how various waste disposal practices (such as those in the Jua Kali sector) may be threatening human health and environmental resources.

To make matters worse, education programmes covering the scientific, technical, and managerial aspects of urban waste management and pollution are either weak or non-existent. Consequently, World Bank [1994] stresses, there is a shortage of professionals who can adequately understand and analyse the relationships between environmental problems, impacts, causes, and preventive and curative actions. Unless all the mentioned aspects are corrected,
the fight against urban environmental degradation will remain an exercise in futility.

2.3.4 Waste Generation and Disposal

According to Kreimer, [1993], indiscriminate emission of gases and fumes into the atmosphere, improper storage, transportation and eventual disposal of liquid and solid wastes, including hazardous wastes, have enormously polluted the environment particularly surface and underground water, air and soil. As such, the general requirement is to identify those activities that pollute the environment, in order to develop strategies for managing their impact on the environment [Kenya, 1994]. This study is one such effort.

Incidentally, wastes are produced in the course of every type of daily activity [Korea 1995]. The most common activities are; transport, industry, agriculture and domestic chores. In Kenya, the unplanned development of small scale enterprises [Jua Kali] has also increased discharge of pollutants into the environment [Kenya, 1994]. Since there is no current study that has focussed on how this wastes from the Jua Kali sector are managed and disposed, this particular study addresses issues of waste management and disposal in the said sector.

Wastes are generated in different forms and toxicity. Toxic pollutants most of which fall under industrial wastes, are usually referred to as hazardous or specified wastes while non-hazards or less toxic wastes constitute what is known as general wastes.
As World Bank [1994] puts it, poorly managed hazardous wastes present a growing threat to cities, particularly when industrial discharges are poorly regulated and when municipal waste management is inadequate. Because of these shortcomings, it is difficult to monitor discharges as well as to ensure that hazardous wastes do not end up in city sewers, landfills, or water used for drinking. This problem is compounded by the large quantities of wastes generated by small-scale and cottage industries and by hospitals and clinics located in and around cities [World Bank, 1994]. Human exposure to these wastes - whether inhaled, ingested, or absorbed through the skin - may result in short term acute effects, long term irreversible chronic diseases, or genetic mutations affecting future generations [WHO, 1991].

Classified on the basis of physical state, wastes fall into three major categories namely: gaseous, liquid and solid wastes. This study concentrated on liquid and solid wastes.

Liquid wastes can be classified according to their sources and characteristics as industrial wastes, urban/municipal wastes and agricultural wastes. Similarly, solid wastes can be further classified into trade wastes, agricultural wastes, institutional wastes, domestic wastes, construction debris and wastes from mining operations.

Industrial solid and liquid waste include: Alkalis, acids, oils, grease, scrap metal, bottles, cans, plastics etc [Kenya, 1994]. Incidentally, these are among the wastes commonly generated by enterprises in the Jua Kali sector [Ogutu, 1996; Lamba, 1994; Kenya 1994; Raymond, 1990].
Others include, equipment and parts cleaning wastes, spent lead acid batteries or battery reclamation and waste rinse/waste water. Thus, the assessment of how they are handled is very important.

Explicitly, a case of increasing requirements for consumer products and services coupled with rapidly expanding technological innovation to make these products and services affordable have placed the process of production in the hands of many people, thus increasing the number of waste generators. Consequently, waste collection and disposal has become a major problem exacerbated by toxicity [Tedder and Pohland 1990], and lack of funds to facilitate its collection. As a result, only 50% of waste is collected in developing cities [Cointreau, 1991]. However, even when budgets are adequate for collection, safe disposal remains a problem [Beukering, Schoon and Mani 1996]. Thus, open dumping and uncontrolled land filling remain the main disposal methods in many developing countries including Kenya [Kenya, 1994; World Bank 1992]. In Kenya the government promotes the Jua Kali sector by constructing sheds without provision for disposal of generated wastes [Kenya, 1986, Ogutu, 1996]. In this study, an endeavour is made to establish whether any government programmes exist which address issues of waste management among the motor vehicle and metal work Jua Kali artisans and if so, assess the success of the programme.

A number of alternatives to disposal have been adopted in many parts of the world. This include recycling and incineration. The environmental justification for recycling has been: reduced demand for energy and finite resources; less water and air pollution; and mitigation
of solid waste disposal.

Though recycling has been adopted in both developed and developing countries, the difference has been that recovering and recycling in the industrialized world is mainly environmentally motivated and public participation and government involvement play a much more important role [Beukering, 1994]. In Britain for instance, a higher level of recycling in Hamburg can be accounted for by three main factors viz: a higher density of recycling facilities combined with the use of more sophisticated collection systems such as dual-bin service for putrescible wastes; a unified administration structure for waste management under direct control of an elected regional government; and a system of proportional representation in local government allowing environmentalist political demands to be directly translated into public policy [Gandy, 1994].

In contrast, recycling in developing countries is done on an informal, ad hoc basis by the poorest citizens [mainly street children] who lack other forms of employment [Lamba, 1994; Otieno, 1992]. This recycling is thus driven by market forces and therefore susceptible to economic fluctuations. In the case of Kenya, and particularly the City of Nairobi, the city authority does not sponsor any recycling, recovery or separation programmes nor does it do any community education on waste management [Lamba, 1994]. This makes the issue of waste management in the City of Nairobi a major concern.

Similarly, the contribution of waste incineration to the disposal of municipal solid waste in developed economies has been rising steadily in the recent past, and the promotion of waste
incineration is now widely portrayed as the only realistic alternative to dwindling landfill opportunities [U.K., 1993]. Incidentally, not only is incineration increasingly presented as the most cost-effective approach to waste disposal, but it is also being put forward as a source of renewable energy integral to a sustainable energy policy [Gandy, 1995]. In fact, it is the shift towards energy recovery rather than materials recovery as the most profitable alternative form of waste disposal to land fill that remarkably changed waste management patterns in London [Gandy, 1994]. Thus, in U.K., some 58% of the renewable energy capacity supported by the Non-Fossil Fuel Obligation levy is derived from waste incineration plants.

In America, the department of sanitation began building new incinerator plants in order to meet the short fall in waste disposal capacity from the exhaustion of landfill sites and the growing political restrictions on ocean dumping. The new incinerator at Brooklyn Navy yard site, for instance, was expected to handle 3000 tonnes of wastes a day, equivalent to some 15% of wastes collected by the New York City [Stevens, 1994].

Incineration plants can therefore help reduce the problem of waste in developing countries. Although the system is used in Kenya, the type practised particularly in the City of Nairobi is the uncontrolled and generally incomplete combustion which result in the release of undesirable pollutants [Otieno, 1992], that contaminate the atmosphere around the city.

Besides this illegal waste combustion, other disposal methods used in the City of Nairobi include open dumping, composting and land filling [Gicheha, 1990; Ruto, 1988; Mbugua,
1980]. However, according to Gicheha [1990], the existing crude land filling in the City of Nairobi is essentially open dumping and is not an acceptable form of solid waste disposal. He thus, concludes that solid waste management in Nairobi has yet to emerge as a well organized programme, and that open dumping with marginal inputs of modern concepts appear to be the common disposal method. Although it is observed that even small scale enterprises generally release their wastes into the collective systems of municipal refuse [Ruto, 1988], no current study outlines the methods used in the release of the wastes from the Jua Kali sector into the said municipal systems. This are some of the issues discussed in this study.

2.4 ENVIRONMENTAL POLICY, LEGAL, INSTITUTIONAL AND EDUCATIONAL ISSUES

Governments and states have endeavoured to establish policies, legal, institutional and educational strategies that would harmonize their development with approved environmental standards. This is in lieu of the fact that, development, unless properly planned, can have disastrous effects on the environment [Ondiege, 1995; Nafukho, 1995]. In Kenya, the government has actually recognized various flaws in its development process and is constantly devising improved guidelines and programmes to promote sustainable environmental management [Kenya, 1994, Nafukho, 1995]. Government efforts in this direction are illustrated by policy statements carried in various documents such as The National Environmental Action Plan [NEAP] report of 1994, and presidential directives and pronouncements such as the ones he made during the official opening of the third session of
the eighth parliament on 6th April 1999.

The government has also established various agencies led by the Ministry of Environment to handle environmental issues and promote sustainable environmental management, which includes supporting those NGOs with environmental protection objectives. The government has further initiated environmental education in the institutions of higher learning [the public universities]. However, the same needs to be initiated in the lower levels of the education system.

A major shortcoming has however been that most of Kenya's efforts at environmental protection have focused mainly on problems that primarily affect rural areas. The policy framework has been designed to redress mainly rural areas ravaged by soil erosion and deforestation among others. This policy approach has oftenly emphasised the need for rural folk to conserve the soil through appropriate methods of agriculture and also address deforestated areas by planting trees. This approach has grossly overlooked the urban environment giving rise to escalation in urban environmental problems [Lamba, 1994].

According to Reed [1996:82], "many reforms associated with structural adjustment have the potential to improve both environmental and economic outcomes". However, he adds, "the failure to implement complementary environmental policies or strengthen institutions and regulations, has created a very mixed environmental record".
Thus, it is important to note that uniform environmental management can only be achieved through comprehensive environmental policies which address both the rural and the urban environment. In the face of inadequate environmental regulatory policies, the country would continue experiencing lack of realistic environmental protection laws and regulations.

Discussing priority environmental problems and policy linkages, World Bank [1994] stated that once a thorough assessment is made of the most pressing environmental problems in a country, and their underlying causes are pinpointed, such information should be used to devise policy responses, or, at minimum, to study the policy implications of the problems.

Environmental authorities in Kenya will therefore need to select the most appropriate policy instruments or group of instruments to meet the particular needs, priorities, and special characteristics of each problem and locality be it rural or urban. Such strong regulatory policies would help mitigate or prevent serious degradation of both rural and urban resources.

To be effective, World Bank (1994) emphasises, these policies must stress the development of appropriate standards and effective monitoring and enforcement systems. Such a framework could include the command-and-control approach to environmental management. This approach involves direct regulation, along with monitoring and enforcement systems; it relies primarily on the application of such regulatory instruments as discharge standards, permits and licenses, land and water use controls, and public health codes. Further, environmental legislation may need to be updated to incorporate new scientific knowledge, to
phase in environmental regulations and standards in accordance with investment and enforcement capacity, and to establish new consultative mechanisms between different levels of government, business, and the public.

To be effective, environmental management policies and plans must also be rooted in an appropriate institutional structure, embodying political, administrative, and technical instruments and arrangements [Habitat, 1986]. As already stated, without enabling legislation, rules, and regulations, and without adequate administrative procedures, environmental policies and programmes can be neither formulated nor implemented. In the words of Reed [1996:83]:

"countries must implement national institutional reforms for environmental management. Environmental issues must be integrated into structural economic reforms since, a strategic vision of the role that natural resources and environmental goods and services could play in the transformation of developing economies is essential to designing appropriate strategies".

The institutional arrangements adopted by nations worldwide to meet environmental management challenges inevitably display great diversity [Habitat, 1984]. The variations allegedly result from the ways in which challenges and problems are perceived and defined, and from the process through which institutions and decision-making arrangements have evolved [Habitat 1986].

Moreover, many countries including Kenya have found it necessary to create new institutions to give special attention to some of the environmental concerns. This has mainly addressed such areas as housing, water conservation and supply, sanitation, urban and rural development
transport, and pollution control. However, such institutions have often proved to be stronger on paper than they are in practice. To be effective, such institutions, especially those with comprehensive mandates, require high level political support, authority and autonomy. They also need access to resources and power to decide how they should be used, and staffs of professionals who are both competent and motivated. Local Authorities are a good case [World Bank, 1994].

When local authorities are weak, urban environmental management is bound to suffer. There are many causes of weakness, including inadequacy of funds made available by central government, inability or unwillingness to generate local revenues, poorly developed capacities for operational and fiscal management, paucity of trained manpower, and lack of career prospects for those who choose to work at the local level [Habitat 1986].

Governments should therefore carefully consider the critical role of local bodies in the formulation and implementation of policies, strategies, and plans for environmental management. Measures to support local authorities imply an additional flow of resources from central government as well as the broadening of local revenue-raising powers, and establishing a competent manpower and knowledge base.

Information and education are also crucial for mobilizing participation in environmental activities and for expanding knowledge about environmental and health conditions and about the effects of various types of development on fragile or hazard-prone land [World Bank
In Kenya, both modes (formal and informal) of transmitting environmental information are used. Formal education is used for capacity building and is mainly institutionalized, while informal education is usually a continuous process and mostly not institutionalized. It also varies from place to place and is basically intended to benefit people outside the formal education system. This is particularly important for Kenya where only 45% of pupils from primary school enter secondary school and even fewer make it to University where environmental education is mainly offered [Kenya, 1994].

Unfortunately, it has been noted that informal environmental education is not very well developed particularly in urban areas and does not reach every active group. As a result, many active groups in the urban areas are unaware of the impact their activities have on the...
environment. Consequently, they do not incorporate environmental protection and improvement measures in their programmes. Further, even when they do, the measures are not comprehensive enough. This study aims at assessing the issue vis-a-vis Jua Kali sector in Kenya.

2.5 APPROACHES TO IMPROVED URBAN ENVIRONMENT

Various approaches to improving urban environment have been proposed by many authorities. In the context of this study, propositions by World Bank [1994] were found more befitting. These include seeking the 'win-win' situations. According to World Bank [1994], 'win-win' environmental solutions occur when environmental and economic goals are complementary.

In particular, the approach requires that significant reductions in environmental pollution be realized at moderate costs by using a combination of regulations, incentives and taxes. Another proposition is investment in environmental improvements. As World Bank [1994] put it, cities have no choice but to invest in environmental improvement, given the damage caused by inadequate environmental management. In Jakarta, for instance, where water supply is inadequate, more than 50 million dollars is spent each year by households to boil water. Investments in water supply can therefore reduce fuel consumption and air pollution [World Bank, 1992].

World Bank [1994] also recommends the need to stress economic efficiency and cost.
recovery. This means that to have environmental strategies work, increased capital investment (as suggested above) must go hand-in-hand with more cost-effective technologies for environmental protection, and with greater economic efficiency and cost-recovery. The viability of an intervention will depend on matching its cost to users' ability and willingness to pay. Potential users should also be ready to pay for the full cost of improved services. Even for such basic services as waste disposal, self-financing should at least be sufficient to pay for recurrent costs. However, it is worth noting that, although user charges can reduce government costs for waste management, public investment may still be needed, particularly for the environmentally sound disposal of urban wastes.

A further proposition for improvement of urban environment was by mobilizing public support and participation. World Bank [1994] argues that effectiveness of environmental decision making can best be achieved through sustained participation of different stakeholders. Through participation, people can influence policy formulation, design alternatives, investment choices, management decisions [Bhatnagar and Williams 1992], and also play a role in the monitoring of environmental interventions in the communities.

Central to mobilizing public support and participation is the issue of raising awareness. To gain awareness, the public and all stakeholders involved in urban environmental management need to learn about environmental risks and how to mitigate or avoid them [World Bank 1994].
The goals of awareness-building are to motivate affected groups to participate in environmental management, stimulate grassroots programs to improve and protect the urban environment, and promote innovations and local knowhow for effective organization and management. This is very important for a productive sector like Jua Kali in Kenya.

2.6 THEORETICAL FRAMEWORK

From the literature review, it is apparent that waste is mainly a result of human sustenance activities and its successful management outwits single-handed approaches. Thus, such a situation can be explained better by a theoretical base that looks at the environment in terms of the organization of human sustenance activities and also, considers the importance of networking between all parties involved in the maintenance and development of the sustenance activities in question. In sociological terms, a number of perspectives can be employed to pursue the stated goal. They include: Functionalism, The theory of Human Ecology, and the Network approach, which are discussed below.

2.6.1 Functionalism

Inkeles [1964] posits that, the main question that functionalism addresses itself to is: 'How is social life maintained and carried forward in time, despite the complete turnover in the membership of society with every new generation?' and the basic answer it gives is: 'Social life persists because societies find means (structures) by which they fulfil the needs (functions)
which are, either pre-conditions or consequences of organized social life'.

By way of definition, Radcliffe-Brown [1971] regards the term 'function' as the contribution which a partial activity makes to the total activity of which it is a part. This view is also held by Abraham [1992] who considers 'function' as connoting an appropriate and sustaining activity or part played by a unit within the context of a larger whole. However, according to Martindale [1960], 'function' is a system-determined and system-sustaining activity, thus referring to interdependencies between social institutions and processes.

In general therefore, functionalism is a sociological perspective which seeks to explain a social element or cultural pattern in terms of its consequences for different elements as well as for the system as a whole, no matter the nature of the consequences. It is an attempt to assess that part played by an observed pattern of behaviour in the maintenance of some larger system in which it is included and also an attempt to explain the persistence of an observed phenomenon with the question of its causes in mind.

Thus, while assessing the management of solid and liquid wastes in the Jua Kali sector, this study was guided by the theory to first understand that Jua Kali sector is a social structure that the society has evolved to satisfy its various basic needs, and as such, it is a part of a system whose sustenance it must contribute to. In Malnowskis' thinking, it is a functional response to individuals physiological needs whose satisfaction contributes to the general well being of the entire society.
It also assisted the study by generating the understanding that not all consequences of Jua Kali activities are positive (a fact that forms the main basis for the study) and that the dysfunctions of the sector could lead to the disintegration and/or change in the entire socio-economic and political system in Kenya. As such, the assessment of management of solid and liquid wastes in the Jua Kali sector would help in dealing with the negative consequences of Jua Kali activities and maintain the desired role of the sector.

However, the theory fails to clearly embed the study in its ecological base, and instead remains abstractional in its accounts giving much emphasis to cultural entities of social systems. Consequently there is need for a supportive perspective whose crux is the ecosystem. Human ecology is apparently one such approach.

2.6.2 Theory of Human Ecology

Human ecology is a social system approach which was developed in 1921 by Park and Burgess of the University of Chicago [Abraham, 1982]. The perspective was later considered by Duncan and Schnore [1959] as being central to sociological analysis because, its view of social organization as the collective adaptation of a population to its environment, avoids the reductionism of behavioral concepts and the etherealism of the value pattern concepts of some culture theorists.
From the ecological point of view, the elementary unit of analysis is 'the pattern of activity' or simply 'activity'. According to Duncan and Schnore [1959], the ecologists' system (as opposed to the functionalists') is an organization of activities, arranged in overlapping and interpenetrating series of activity constellations, or groups. They consider the ecologists' primary concern to be the pattern of observable physical activity itself, not the individual's feelings of obligation concerning their roles.

Thus, according to Abraham [1992], the salient features of the ecological perspective may be summarised as:

1) The study of spatial relationship because territoriality is a major factor giving unit character to populations and also because space is simultaneously a requisite for the activities of any organizational unit and an obstacle which must be overcome in establishing interunit relationships.

2) The interdependence of organisms and environment. In this case, it is not just a matter of analysing the patterns of spatial distribution because of certain surface features, but dealing effectively with the process of adaptation of the organism and the social organization to the environment by coordinating the flow of energy, information, and material.

3) A holistic approach which views organization as the property of population taken as a whole and not of a collection of individuals. It deals with the community as a system while rejecting the culturological interpretations which assign the organism and the social organisation a passive role.
4) The concept of equilibrium. Morphological change is assumed to be a movement toward an equilibrium state through a succession of ecological adaptations and continuous modification. However, unlike the equilibrium notion inherent in functionalism or system theory, the ecologists' usage of the term harbours no teleological overtones.

5) Strong empirical base. Unlike the other general sociological theories such as symbolic interactionism, functionalism or system theory, human ecology has a strong data base. It is generally believed to have evolved out of a series of community studies, particularly studies of urban growth and settlement patterns.

6) Inter-disciplinary frame of reference. Ecological research has always been a cross disciplinary activity involving diverse perspectives from biology, economics, geography, demography, epidemiology, sociology and psychology. The fact that human ecology lends itself so well to fruitful exchanges among disciplines may be attributed to its strong empirical base and its relatively concrete view of society. As Duncan and Schnore point out, one need not even call oneself an ecologist to do ecological research or to employ essentially ecological concepts.

According to Hawley [1971], human ecology seeks its explanations among variables that are structural properties, demographic attributes, and features of environment, including interactions with other systems.

In particular, Hawley [1950] observes that, the main task of human ecology is the analysis of
community structure in terms of the organisation of sustenance activities. That is, the sustenance activities have to enable the community adapt to its environment appropriately by enabling the members of the community satisfy their needs while protecting and improving the environment. The theory guides this study in analysing Jua Kali activities as sustenance activities meant to enable members of the community adapt to particularly urban environment, while at the same time protecting and improving this environment through appropriate management of the resultant wastes.

At the centre of sustenance activities is the factor of technology. For these activities to ensure sustenance, the technology involved should be appropriate in the sense that it contributes to the sustainable management of the environment. This is why Duncan and Schnore [1959] identified technology as one of the components of the ecological complex as indicated in Figure 1 below, and emphasized the existence of interdependence between the components.
They saw technology as a set of techniques employed by population to gain sustenance from the environment, and to facilitate the organization of sustenance-producing activity. Thus, though Jua Kali activities have been widely regarded as an epitome of innovative and appropriate technology, there is need to establish whether they ensure sustainability by protecting and improving the environment within which they are undertaken. This theory guided the study in the pursuit of this goal.
Human ecology also appreciates the importance of information. Information is considered necessary for the maintenance of structures. In the context of this study, information serves to control, modify and articulate the rate and pattern of material flows between Jua Kali and the environment. Thus the theory guided the study in investigating artisans exposure to informal environmental education.

However, despite the rich evidence inherent in functionalism and human ecology that every activity, process or phenomenon carries with it a number of stakeholders who must network to sustain the system as a whole, little attempt is made by the two theories to explain the importance of the phenomenon of networking among the stakeholders for the purpose of ensuring that the activity, process or phenomenon in question is development and environmental friendly. Thus, to explain this, the study relied on The Network/stakeholder Approach.

2.6.3 The Network/Stakeholder Approach

The main argument of this approach boarders on the fact that, the existence of any particular activity implies the existence of several stakeholders. Therefore, the success of the said activity highly depends on the demands and inputs of these stakeholders. In the context of this study, the success and growth of Jua Kali activities highly depends on the demands and inputs of such stakeholders as environmentalists, technologists and economists among others. They all
have a role to play in the shaping of the activity to satisfy their particular needs. Thus, a
network between such groups is necessary if any of the objectives to be met via the activity
is to be realised satisfactorily.

Networks have been promoting environmental and sustainable development in urban areas
over the years [Habitat, 1996], with formal and informal networking increasingly being seen
as important for the sharing of ideas and experiences in the development, management and
implementation of policies and projects. Indeed, individuals, organizations and community
groups with different resources and needs all have a role to play in the urban development
process. In this connection, an interesting approach is one of partnership. Thus, this theory
guided the study in its attempt to establish whether there exists an appropriate partnership in
the management of the various Jua Kali activities including disposal of wastes.

Habitat, World Bank and UNDP ran a network programme on urban management that within
its broader scope has a particular interest in environmental issues [Habitat, 1996]. It is such
a network that can assist in moulding the Jua Kali sector into an undertaking that enhances
both the environment and economic wellbeing of the people given that, World Bank and
UNDP are well known stakeholders in the Jua Kali activities.

As a matter of fact, the use of the approach in the Jua Kali sector will not be new since, the
approach has been used in the analysis and enhancement of the economic performance of
small-scale enterprises vis-a-vis the macro enterprises [McCormik, 1994; Pedersen, 1993].
Thus, what seems to be lacking is the application of the same approach to environmental management. This should basically involve bringing together all groups with different specialized backgrounds and resources to input into the development of the sector. At the centre of it all is information and technology.

2.6.3 The Conceptual Model

Given the need to provide a comprehensive explanation of the study, which the individual theories could not afford, a conceptual model was adapted. The conceptual model borrows from the three theories by harmonizing their different stands.

The model attempts a synthesis of the tenets of Functionalism, Human ecology and Network approach. However, the model is highly at the policy level, having been occasioned by the fact that the shaping of most activities in the informal sector depends on the policy environment. The model is illustrated in Figure 2 below.
Figure 2: Conceptual Model of the Comprehensive Approach to Economic Development and Environmental Protection

Government as Principal Policy Maker

Level 1

Economic Policies encourage economic investment e.g. Jua Kali etc

NGO’s Private Agencies and Individuals involved in both economic and environmental issues

Environmental policies encourage environmental investment e.g. awareness

Feedback From the Community

Level 2

Sustenance activities (Jua Kali)

Level 3

Growth in income

Quality Environment

Quality life

Key

Weak relations

Strong relation
At level one of the model, the government is presented as the prime player in the entire set up that determines the nature of sustenance activities. It is the main source of policies that give guidelines. At the same level, it is also shown that the policies encourage NGO’s, Private Agencies and Individuals to undertake various investments that conglomerate into sustenance activities. At the same time, these NGO’s, Private Agencies and Individuals who are stakeholders, influence the manner in which the policies are formulated. The final outlook of sustenance activities as shown at level two emerge as a product of networking between all interested parties. It is such a model which should be adopted in the development of the Juá Kali sector to enhance sustainability.

Level three of the conceptual model shows that, the consideration for both economic and environmental issues in the development of sustenance activities such as Juá Kali enhance both environmental quality and growth in income and by extension the quality of life. The quality of life, as shown by the broken line in the conceptual model, serves as a source of feedback to enable the stakeholders re-evaluate the impact of the sustenance activities.

2.6 Summary

This chapter has clearly shown that urban environment is highly degraded and that a lot is being done to salvage it [UMP 1994 and Habitat 1991]. It has also shown that waste is generated through various activities including those of the informal sector and in different forms [Korea, 1995; Ondiege, 1995; Lamba, 1994; Kenya, 1994; Raymond, 1990]. In Kenya
Jua Kali has been identified as one of the producers of waste [Kenya, 1994; Ogutu, 1996; Lamba 1994]. However, the disposal of these wastes has been found wanting, with open dumping, burning, composting and unsanitary land filling being presented as the common methods [Gicheha, 1990; Ruto 1988; WCED, 1987; Mbugua, 1980; Edington, 1977]. In Kenya, there is also lack of proper policy, legal and institutional establishments to correct the situation [Kenya, 1994; Lamba, 1994]. This is further compounded by lack of public awareness as a result of insufficient environmental education programmes. To explain the various issues in the study, three theories have been used namely Functionalism, The Human Ecology and Network/Stakeholder approach. But since the three theories could not provide a full account of the study, a conceptual model that borrows from all the three perspectives was adopted to complement the theoretical framework. The next chapter discusses the study site and the research methodologies that were used in the collection and analysis of the studies data.
CHAPTER THREE

STUDY SITE AND METHODOLOGY

3.1 INTRODUCTION

This chapter describes the study site and discusses the methodological procedure which was used in the collection and analysis of the data.

3.2 THE STUDY SITE

The study site was the City of Nairobi which is historically believed to owe its existence to the Kenya-Uganda railway. The rail head is said to have reached Nairobi in May 1899 on its way to the present-day Kisumu which was then part of Uganda. In particular, the moving of the railway headquarters from Mombasa to Nairobi resulted in the subsequent growth of Nairobi as a commercial and business hub of the then British East Africa Protectorate.

By 1900, Nairobi had, reportedly grown to a large and flourishing town, though settlements mainly consisted of the railway buildings and separate areas for Europeans and Indians with no African yet. It is in this same year that Nairobi is said to have assumed the functions of the capital of Kenya, with municipal regulations in place and the boundary defined. The naming of the town as the capital of Kenya was however done in 1907.

The boundary of Nairobi was later [1927] extended to cover 30 square miles mainly as a result
of the rapid growth of the town both in terms of population and infrastructure, [Situma 1988].

The extension of the city's boundary was further done in 1963 to cover an estimated area of 266 square miles. However, the real expansion of the city was expected to occur within the built-up area and mainly on the 20 square miles of black cotton soil and ranching land to the east of Nairobi. This is presently indicated by the building up of the several residential estates to the east of Nairobi city. These are areas of high population density, housing more than 70% of the African population on about 10% of the total housing area.

Demographically, Nairobi City is said to have been hosting about 11,000 people by 1906. This rapidly increased to about 270,000 people at independence in 1963. At this time, the Africans who were the majority of the total population lived in Eastlands while the Europeans and most of the Indians lived in the western suburbs with generally better services than those available in the African areas.

At present, the population of Nairobi is estimated at not less than 2.0 million people and is growing at an annual rate of about 5% mainly due to rural-urban migration [JICA 1998]. It is further estimated that in the course of the new millennium the population of Nairobi will rapidly grow to about 4.0 million people with about 250,000 potential wage earners doing without formal employment, [Situma 1988].
3.2.1 Location and climate of Nairobi

The City of Nairobi lies at an altitude of 1670 metres, latitude 36° 50' east and longitude 1° 17' south about 140 kilometres south of the Equator. The Indian ocean town of Mombasa is about 495 kilometres away while Kisumu town is about 338 kilometres to the west. Lying so close to the Equator but being almost 1700 metres above sea-level, Nairobi temperatures are said to be altitude-modified tropical, but not torrid. The months of July and August are distinctly cool. The mean annual temperature is 17°C and the mean daily maximum and minimum temperatures are 23°C and 12°C, respectively.

Despite the above mean temperatures, Nairobi is said to have an urban heat island that is usually experienced when one is travelling in and around the city centre from suburbs and the countryside. This warmth is reportedly caused by the increased absorption of solar radiation by built structures and hard surfaces in conjunction with black tops due to their excessive heat storage capacity. It is further worsened by lack of vegetation to utilize incoming energy for evapotranspiration, and the increased air pollution of different kinds, leading to additional heat absorption by the atmosphere. This state of affairs is on the increase.

In terms of rainfall, Nairobi is said to experience a mean annual rainfall of 1080 millimetres falling in two distinct seasons. The long rains usually fall from March to May while the short rains occur from mid-October to December. Sometimes during the long rains, the city
experiences torrential floods with devastating effects on particularly human life. Besides, these floods contribute a lot to the pollution of water bodies in and around the city by transporting the improperly disposed wastes to these water bodies.

The study's specific locality was the Kamukunji-Gikomba-Ziwani area as indicated on the maps 1 and 2 (see appendices eleven and twelve). This is a region to the east of Nairobi City, about 1-2 kms from the Central Business District (CBD). It is a less affluent area whose main economic activities constitute small scale enterprises. It also happens to be the site of the first Nyayo sheds for Jua Kali operators in the City of Nairobi [Macharia, 1995 and King, 1996].

3.4 RESEARCH DESIGN

A survey design was used to facilitate data collection on the current state of waste management in the Jua Kali sector, artisans level of informal environmental education, and government involvement in the management of waste from the Jua Kali sector. This design made it possible for both quantitative and qualitative data to be collected, and the use of both descriptive and inferential statistics in the analysis of the data.

3.4.1 Types and Sources of Data

Data was obtained from both primary and secondary sources. Primary data was gathered through field survey conducted by the researcher with the help of a research assistant who
went through proper training before field work commenced. Sources of secondary data included books, pamphlets, research reports, theses, journals, conference reports and newspapers. The main techniques employed in the collection of primary data were as outlined below.

3.4.2 Primary Data Collection Techniques

Primary data collection in sociological studies is done by use of two major techniques viz observation and interview. Observation could be categorized as: uncontrolled non-participant or straight/direct; non-controlled participant observation and controlled non-participant or laboratory observation. On the other hand, interviews could either be formal or informal. In this study, three of the stated sub-techniques were used namely uncontrolled non-participant observation, informal, and formal interviews.

Explicitly, uncontrolled non-participant observation could be described as 'pure' observation in that the observer does not participate in any way in the social interaction under observation and also does absolutely nothing to control the setting or the behaviour of the people observed. Otherwise stated, no external stimuli are applied to the subjects of the observation. This technique allowed the researcher to observe the pattern of physical waste handling at the sites unfold normally since the artisans suspected no surveillance.

On the other hand, informal interviews were used on officials of Jua Kali associations and
Nairobi City Council to clarify and elaborate on the main themes of the study. Interview guides were prepared to help the interviewer remember the kind of issues he wanted the respondents (officials) to elaborate on.

Formal interviews involved an appreciable amount of control over both the presentation of the questions and the recording of the answers. In this case, a number of specific questions were prepared before hand for testing and interview schedules were used to standardize the stimulus-response situation of the interview. The formal interviews generated information that could be analysed in tabular form for statistical presentation. The interview schedule used was pre-tested through a pilot study of 10 artisans who were not part of the sampling frame and the necessary changes effected. The schedule contained both open ended and closed ended questions. The questions focussed on the type of wastes generated, common waste disposal techniques, participation of artisans in informal environmental education, awareness regarding the environmental quality implications of the common waste disposal habits and the government's role in waste management by the Jua Kali sector (see appendix one).

3.4.3. Target Population and Sampling Frame

The study's target population consisted of all those Jua Kali artisans involved in business activities that use technical skills and know-how to manufacture goods, or use technical skills in the provision of various services. The sampling frame comprised of those artisans who deal in metal work and motor vehicle repair and are members of the Kamukunji and Ziwani Jua
Gl
Kali associations.

3.4.4 Sample Size and Sampling Procedure

From a group of about 790 artisans, a total sample of 79 artisans [43 from Ziwani and 36 from Kamukunji] was drawn for the study. This is about 10% recommended for surveys [Mugenda and Mugenda 1993]. In addition, 2 officials from the Jua Kali associations, and 1 from the Nairobi City Council were informally interviewed.

The sampling involved simple random and systematic procedures. Simple random technique was used to establish starting points in each of the two sites, where as subsequent 10-th sample units were reached on the basis of systematic sampling.

To reduce incidences of refusal and/or dishonest among the respondents, the researcher ensured a properly established rapport through the association's officials and made re-visits in cases of improper timing. However, in the event of protracted inconveniences, the researcher opted for a sample unit replacement by taking the unit that came immediately after the failed unit.

3.4.5 Data Processing and Analysis

According to Mann [1988], one can hardly make any sensible social statement without...
implicity or explicitly involving ideas which are, at base, quantitative. In the context of this study, the formal interviews were aimed at generating mainly answers that could be quantified and analysed in tabular form for statistical presentation. Thus, the main mode of data analysis was quantitative which made it possible for figures and tables to be generated and used to explain the results.

The quantitative data was cleaned before the responses to open ended questions were coded. It was then entered into the computer for analysis. The first level of analysis produced frequencies and percentages. Through this analysis, figures and tables were then generated, and chi-square ($x^2$) tests run. The processed chi-square ($\chi^2$) values were compared with critical values of chi-square ($\chi^2$) obtained from a standard table at 0.01 significance level for specified degrees of freedom. The comparison helped in determining the 'Goodness of Fit' of the study's findings by checking whether the calculated $x^2$ values are less than or equal to the table (critical) values. The 'Fit is Good' when the calculated value of $x^2$ is much less than the table value, [Balchandani, 1982].

It is worth remembering at this juncture that there are two types of tables showing the values of $x^2$ prepared under different conditions. They are:

[a] The table in which the probabilities of the calculated values of $x^2$ arising due to sampling fluctuations are shown for the given degree of freedom. In this case, one finds out the probability of the observed value of $x^2$ and thereby ascertain whether the