

UNIVERSITY OF NAIROBI

FACULTY OF ARTS

DEPARTMENT OF SOCIOLOGY AND SOCIAL WORK

**HUMAN ADJUSTMENT TO SOLID WASTE
POLLUTION: A CASE STUDY OF DANDORA AREA
IN NAIROBI //**

By:

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DECLARATION

This is my original work and has not been submitted for a degree qualification in any other university or institution of higher learning.

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The research project has been submitted for examination to the Department of Sociology and Social Work, Faculty of Arts, College of Humanities, University of Nairobi, with our approval as supervisors.

Supervisors: Prof. C.O. Awuondo
Signature:
Date : 14-08-2008

DEDICATION

This project is dedicated to the my parents Emmanuel and Salama Mwalagho who educated and instilled in me the value of hard work and perseverance and whose dream is to see me obtain a Doctorate of Philosophy.

To my wife Sally and daughter Salama for your continuous support and encouragement.

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For the people of Dandora who assisted me in data collection , this project gave another reason to meet and interact with you and learn about the struggles that you are going through in life. I learnt a lot and increased my desire to make a difference in the lives of people who struggle very hard to make ends meet despite the enormous challenges

Lastly I would want to give thanks to the almighty God who has blessed me with the opportunity to further my studies and given me the strength, wisdom and courage to be able to start and conclude my course.

ABSTRACT

This study examined the human adjustment to solid waste pollution: a case study of Dandora area in Embakasi constituency in Nairobi Province. Nairobi like other developing world cities is characterized by rapid population growth and urbanization hence vast amounts of solid waste that are generated and dumped in the city untreated. The increase in solid waste generation has not been accompanied by an equivalent increase in the capacity of the relevant urban authorities to deal with this problem. There is an urgent need for new methods of waste handling and promoting fuller environmental awareness.

Dandora has an estimated population of 110,164 and has a land area of 4square kilometres with approximately 27,541 persons per square kilometre. Dandora is located East of the city in Embakasi Division and borders Kasarani Division to the North, a division which comprises poor neighbourhood such as Korogocho and Kariobangi. The three neighbourhoods of Dandora, Kariobangi and Korogocho are estimated to host over a quarter of a million residents. However, the study is restricted to Dandora phase two due to the high population and proximity to the dumpsite by the Nairobi City Council.

The general objective of the study was to assess the contribution of the community and government in trying to combat the pollution problem in Dandora. The specific objectives include:- To establish the extent solid waste pollution has impacted on the lives of the residents of Dandora. To find out the perception and attitudes of the residents of Dandora towards solid waste management problems. Identify and appraise community mechanisms for solid waste management with the aim of suggesting more guidelines.

The study adopted both probability and non-probability sampling techniques. Data collection methods and instruments included structured questionnaires, field observations and personal interviews.

This study had a total of 68 respondents all residents of Dandora phase one. Descriptive technique was used to organize, summarise and interpret quantitative information. Data was presented in form of frequency tables. The benefits to the residents are short term compared to the large and complex social and economic effects that the dumpsite has on the residents of Dandora. Some benefits such as composting and recycling of plastics and metals that are sold to dealers can be seen as short term. In the long term the impact of pollution to the environment has caused the residents to suffer from such diseases as respiratory tract irritation affecting/

It was also noted that the level of awareness about pollution is also very high among the residents with 89.7% of residents saying they are aware of the pollution problem. 79.4 % of the residents said pollution was a big problem in Dandora with the blame resting squarely on the government and the Nairobi city council. 76.5% of the residents said the pollution problem is still increasing this is seen as a result of increase in population and improvement of the economy therefore more consumerism.

The community identified some community coping mechanisms like the presence of CBO's that helped in cleaning the environment and benefits derived from recycling some of the wastes like plastics and metals and composting which they sell to farmers.

Some suggestions they came up with were like more environmental education or sensitization that will help them to influence change through choosing of leaders who will champion their rights and grievances. Through education they will also be more aware of the health hazards that emanate from the dumpsite and be able to make informed decisions.

From the findings we can conclude that social impacts are serious since many school going children have dropped out of school to go and work in the dumpsite to earn a living. Children should be encouraged to go back to school in order to be able to reduce illiteracy among the residents of Dandora. Crime rate is high and this has affected people living in Dandora. There should be a better way of handling crime in the area so as to discourage those children who drop out of school joining with criminals because of being with them within the dump site. To stop the high school drop out the children should be facilitated to return to school and access vocational and skills training. They should be taken to homes where they can be able access to food, they should also be educated on peer influence. Equipped with the vocational and skills training they should be encouraged to earn their living hence reduction of poverty in the region. HIV/Aids awareness should be enhanced in the region and assist the orphaned children to continue with the schooling instead of dropping out of school.

Some recommendations were drawn as follows that various actors involved in waste management including NCC, Ministry of local government, Ministry of Environment and Natural Resources, National Environment Management Authority, NGO's and CBO's need to come up with a broad policy document similar to the White Paper on Integration Pollution and Waste Management in South Africa that will aim at eradicating pollution and ensuring that citizens of Dandora don't suffer unnecessarily due to the fumes emanating from the dumpsite. Investment in incineration should be explored in the treatment of solid waste as compared to the current method of open pit dumping and combustion, which has exacerbated the pollution problem. The cost of putting up an incinerator is huge and therefore privatization would be a viable option. The recycling of some wastes like plastics and metals and composting should be encouraged from the source of the wastes. A change of attitudes on the consumers to segregate the wastes from the household level will reduce the levels of pollution. Stakeholders in Nairobi's solid waste management sector, for example, have demonstrated the robustness of the criteria. According to them, economic instruments appropriate for the sector are those that are politically acceptable and ensure support to the people living around the dump site. Promote poverty reduction, employment and economic growth.

Further Recommendations for the dump site include removal of the dumpsite from Dandora to a non-residential area. The use of the waste to generate energy that can be used in many households has been practiced in developed countries like Britain, we can borrow a leaf and ensure we turn this waste into a viable energy resource for the country to supplement the existing energy supplies.

TABLE OF CONTENTS

| CONTENTS | PG. |
|---------------------------------------|------------|
| Declaration | ii |
| Dedication..... | iii |
| Acknowledgement | iv |
| Abstract | vi |
| Table of Content | x |
| List of Tables | xiii |
| List of Figures..... | xiv |
| List of Acronyms | xv |
| CHAPTER ONE: INTRODUCTION | |
| 1.1. Background Information | 1 |
| 1.2. Problem Statement | 6 |
| 1.3. Purpose of the Study | 8 |
| 1.4. Objective Study | 8 |
| 1.4.1. Specific Objectives..... | 8 |
| 1.5. Scope and Limitation..... | 9 |
| 1.6. Justification of the Study..... | 9 |
| 1.7. Definition of Terms | 10 |
| CHAPTER TWO: LITERATURE REVIEW | |
| 2.1. Introduction | 11 |
| 2.2. Theoretical Framework | 20 |
| CHAPTER THREE: METHODOLOGY | |
| 3.1. Introduction | 32 |

| | | |
|------|---|----|
| 3.2. | Site Selection and Description | 32 |
| 3.3. | Unit of Analysis and Observation | 33 |
| 3.4. | Sampling Design | 33 |
| 3.5. | Data Collection Methods and Instruments | 34 |
| 3.6. | Data Analysis | 35 |

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

| | | |
|------|--|----|
| 4.1 | Introduction | 36 |
| 4.2. | Background Characteristics of the Respondents | 36 |
| 4.3. | To Establish the Extent Solid Waste Pollution has Impacted on the lives of the Residents of Dandora | 40 |
| 4.4. | To find out the Perception and Attitudes of the Residents of Dandora towards waste Management Problems | 46 |
| 4.5. | To Identify and Appraise community Mechanisms for solid waste management with the aim of suggesting more guidelines | 48 |
| 4.6. | Community Coping Mechanisms | 50 |
| 4.7. | Summary of the Findings..... | 51 |

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

| | | |
|------|-------------------------------|----|
| 5.1. | Introduction | 52 |
| 5.2. | Summary..... | 52 |
| 5.3. | Conclusion | 53 |
| 5.4. | Recommendations..... | 54 |
| 5.5. | Further Recommendations | 55 |
| | REFERENCES..... | 57 |

APPENDICES

| | |
|--|----|
| Appendix I: Letter of Introduction from the University | 59 |
| Appendix II: Questionnaire to the Residents | 60 |
| Appendix III: Questionnaire to the Doctors..... | 64 |

LIST OF TABLES AND FIGURES

| Table | Pg |
|---|-----------|
| Table 1 : Distribution of Respondents by their Gender..... | 36 |
| Table 2 : Distribution of the Respondents by their Age..... | 37 |
| Table 3 : Distribution of Respondents by level of Education..... | 38 |
| Table 4: Distribution of Respondents by their Marital Status..... | 38 |
| Table 5 : Distribution of Respondents with their Monthly income..... | 39 |
| Table 6: Distribution of Respondents by Occupational Status..... | 39 |
| Table 7 : Distribution of Respondents by Awareness of Pollution Problem in Dandora..... | 40 |
| Table 8: Distribution of Respondents with factors that contribute To social impact..... | 41 |
| Table 9 : Distribution of Respondents and Economic impact..... | 43 |
| Table 10: Distribution of Respondents and Health impact..... | 45 |
| Table 11: Distribution of Respondents by asking whether pollution is a problem in Dandora..... | 47 |
| Table 12: Evaluation of the Importance of Community Participation in Pollution Management and Prevention in Dandora..... | 49 |

LIST OF FIGURES

| Figure | Pg |
|---|-----------|
| Figure 1: State of the Worlds Waste Industry..... | 3 |

LIST OF ACRONYMS

| | |
|------|--|
| CO | Carbon Monoxide |
| ITDG | Intermediate Technology Development Group |
| KNBS | Kenya National Bureau of Statistics |
| JICA | Japan International Cooperation Agency |
| MSW | Municipal Solid Wastes |
| NCC | Nairobi City Council |
| SWM | Solid Waste Management |
| SOX | Sulphur Oxides |
| UNEP | United Nations Environmental Programme |
| VOCs | Volatile Organic Compounds Nitrogen Oxides (NOX) |

CHAPTER ONE

INTRODUCTION

1.0. Background Information

Over the last three decades there has been increased global concern over the factors attributed to environmental pollution in particular the global burden of diseases. WHO estimates that about a quarter of the diseases facing mankind today occur due to prolonged exposure to environmental pollution. These diseases are acquired during childhood and manifest later in adulthood. Improper management of solid waste is one of the main causes of environmental pollution and degradation in many cities, especially in developing countries. Many of these cities lack solid waste regulations and proper disposal facilities, including for harmful waste. Such waste may be infectious, toxic and radioactive.

Rising quality of life and high rates of resource consumption patterns have had a unintended and negative impact on the urban environment-generation of wastes far beyond the handling capacities of urban governments and agencies. Cities are now grappling with the problems of high volumes of waste, the costs involved, the disposal technologies and methodologies, and the impact of wastes on the local and global environment. But these problems have also provided a window of opportunity for cities to find solutions involving the community and the private sector; involving innovative technologies and disposal methods; and involving behaviour changes and awareness raising. These issues have been amply demonstrated by good practices from many cities around the world. There is a need for a complete rethinking of "waste" - to analyze if waste is indeed waste. A rethinking that calls for "WASTE to become WEALTH, REFUSE to become RESOURCE, TRASH to become CASH."

There is a clear need for the current approach of waste disposal that is focused on municipalities and uses high energy/high technology, to move more towards waste processing and waste recycling (that involves public-private partnerships, aiming for eventual waste minimization - driven at the community level, and using low energy/low technology resources. Some of the defining criteria for future waste minimization programmes will include deeper community participation, understanding economic benefits/recovery of waste, focusing on life cycles (rather than end-of-pipe solutions), and decentralized administration of waste, minimizing environmental impacts and reconciling investment costs with long-term goals. Municipal solid wastes (MSW) in general constitute about 14-20 percent of all wastes generated worldwide, with other waste types including construction and demolition wastes (30%), manufacturing (20%), mining and quarrying (23%), and others.

Kampala with a population of 1.5 Million generates 750 tonnes and Dar Es-Salaam with a population of about 3 million people generates about 2,600 tonnes in a day. In most of these East African urban centres, the councils collect only about 40% of the total generated garbage due to limited finances, vehicles and personnel. The rest is left unmanaged leading to current garbage heaps and are a common site in residential areas, along the roads and within the central business districts (ITDG, 2004).

Nairobi has been growing fast during the last three decades. Its population has grown from an estimated 1.1 million people in the year 1985 to around 3 million today with the numbers set to rise to about 3.8 million by year 2015 (KNBS, 2007). Such rapid urban growth has caused deterioration of solid waste management services in the city resulting in environmental pollution (Kibwage, 2002). Human settlement in Nairobi is dominated by

informal settlement, which lack basic infrastructure, such as urban transport, water and sanitation. The city lacks an environmental policy and is therefore plagued by serious problems of waste management and pollution. This tends to affect the quality of human settlement and lives in general.

Much of the wastes generated worldwide (57 to 85%) were primarily disposed in landfills, including open and engineered landfills. Other means of waste disposal included:

| Continent | Percentage of Waste Disposed by | | | | | |
|---------------|---------------------------------|------------------------------|----------------------|---------------------|-------------------------|---------------|
| | <i>Recycling</i> | <i>Sanitary Landfill</i> | <i>Open Dump</i> | <i>Incineration</i> | <i>Open Burning</i> | <i>Others</i> |
| Africa | 3.9% | 29.3% | 47% | 1.4% | 9.2% | 8.4% |
| Asia | 8.5% | 30.9% | 50.9% | 4.7% | 1.7% | 4.5% |
| Europe | 10.7% | 27.6% | 33% | 13.8% | 11.8% | 4.4 |
| North America | 8.1% | 91.1% | 0 | 0 | 0 | 0 |
| Latin America | 3.2% | 60.5% | 34% | 2% | 5.5% | 2 |

Source: Statistics are from UNEP-ISWA State of the Waste Industry

We see three worldwide trends - one, of waste volumes increasing, two, of waste qualities changing, with more inert and inorganic wastes being generated, and three, hazardous wastes also being included. For example, the Basel Convention has estimated that in its signatory countries, the amount of hazardous and related wastes generated for 2000 and 2001 was 318 and 338 million tons respectively. The indiscriminate and improper dumping of MSW, often mixed with hazardous wastes like medical waste without treatment raises several serious environmental issues, including loss of renewable resources

such as metals, plastic, glass; loss of potential resources such as compost from organic waste, and energy from burnable waste etc. Contamination of land and water bodies due to discharge of leachate and other hazardous materials, and air pollution due to emissions from burning and release of methane from anaerobic decomposition also remain as concerns. Risks to human health (respiratory problems, skin and other diseases, and longer term impacts due to dioxins etc.) and spreading of disease by vectors in areas near landfill sites are other critical issues.

An example of increase in recycling, and consequent decrease the amount of waste going for landfill, comes from Nova Scotia, Canada. In 1989, Canada set a target to halve the amount of MSW by the year 2000. As a result of a comprehensive Solid Waste Resource Management Strategy, Nova Scotia (641,575 tons in 2000) managed to reduce the waste sent to landfills and incinerators by 46 percent by increased recycling and composting. The Payatas dump is Manila's largest garbage disposal site, receiving about 5000 tons of garbage everyday. Six mountains of garbage upto 15metres high have been created. More than 80,000 slum dwellers live around this area, many earning their living as waste pickers. These residents face severe health problems such as typhoid, hepatitis, cholera, and other infectious diseases. In 2000 one of the hills collapsed due to heavy rains killing 205 persons. The dump site has been closed since 2004. As a result of the problems associated with the proper disposal of wastes, there is a clear need for a multi-stakeholder partnership in proper and integrated waste management in all stages - collection, transportation, treatment, and disposal, but especially at the source where it is generated, and integrates it with policies that encourage the 3Rs -reduce, reuse and recycle.

The Case of Nairobi City

Nairobi is increasingly being faced with vast amounts of solid waste that are generated and dumped in the city untreated. This is partly due to the rapid population growth but also to the unplanned development of informal business. Solid wastes in Nairobi are a by-product of a broad spectrum of industrial, service and manufacturing processes. Primary high-volume generators of industrial solid wastes include the chemicals, petroleum, metal and wood, paper, leather, textile and transportation industries. Secondary small generators include auto and equipment repair shops, electroplaters, construction firms, dry cleaners and pesticide applicators. There is also domestic waste which is mostly organic and offers an opportunity for livelihoods from composting hence it is reused in urban agriculture or for energy generation (City of Nairobi Environmental Outlook Report, 2007).

Waste management is a growing problem in Nairobi. The increase in solid waste generation has not been accompanied by an equivalent increase in the capacity of the relevant urban authorities to deal with this problem. About 40 % of the waste generated in Nairobi is collected by the City Council of Nairobi, the private sector collect about 20 percent and the balance is left uncollected or is disposed of through other means (Ikiara, 2006).

Inequality in the geographical service distribution characterizes the sector. Broadly, the western part of the city is well serviced (in garbage collection) by the private firms and the Nairobi city council while the Eastern part is hardly serviced. High and some middle income residential areas together with commercial areas are well serviced by private companies and even the NCC. Small private firms are increasingly servicing some of the relatively better-off low income areas. It is estimated that 75% of the city depends on service by private companies (UNEP, 2005) but most middle and low income

neighbourhoods do not receive service from NCC or NCC-contracted companies at all. The core low income areas where an estimated 44% of the city population live below the poverty line. Not surprisingly thus, residents in low income areas are dissatisfied with waste collection services, they are aware of the health risks associated with the problem, and are willing to pay for improved services inspite of their low incomes.

There is only one official dumpsite (NCC-Owned and operated-Dandora) which is full and located in a densely populated part of the city, a whole 8Km from the central business district along a road with heavy traffic. Moreover, waste pickers and dealers 'control' this dumpsite, forcing the NCC and private companies to bribe to access the dump site. Dandora dump site is littered with all types of wastes from hospital wastes, manufacturing/industry wastes, plastics, papers and biodegraded materials. This has led to widespread indiscriminate dumping in illegal dumpsites, along roadsides and waste pickers litter the city with the unusable waste materials without control.

1.2. Problem Statement

Nairobi like other developing world cities is characterized by rapid population growth and urbanization. The city has a population of about 3 million people who are generating substantial amounts of solid waste. The city is also surrounded by 4 satellite towns that are also fast growing and do not have waste disposal facilities.

Nairobi has increasingly being faced with vast amounts of solid waste. Nairobi produces an estimated, 2200tonnes of garbage a daily (Ikiara, 2006) and increase of 27% up from 1600tons estimated in 2002 (Ikiara, 2003). The rest is carted away to Dandora dump site hence this has resulted to be a major problem because of poor solid waste management by

the NCC and other stakeholders (Kantai, P. 2000). This problem of solid waste management services in Nairobi is attributed to insufficient financial outlays, shortages of equipments and unfavourable institutional and organization arrangements. Furthermore, there is an absence of a systematic and integrated approach to tackling the waste management problem. The attitude of poorer city residents towards environmental cleanliness is also a contributing factor (Kibwage, 1996; Peters, 1998). Even the city fathers admit to this by indicating that solid waste is another big challenge as the city is increasingly faced with vast amounts of waste that is dumped in the city untreated. We have a major crisis with solid waste and that has been the biggest challenge in running the city (Wathika D. Mayor Nairobi, 2007). Hence, there is an urgent need for new methods of waste handling and promoting fuller environmental awareness.

The city is served by Dandora dump site alone hence emergence of other dump sites and despite privatization of waste collection services, areas occupied by the poor have not been served. As a result of this disposal problem, almost all enterprises tend to use uncontrolled and unhygienic landfills as the predominant mode of disposal. To cut costs, many generators of solid waste have now taken to combustion at the site, which causes air pollution problems. Much of these wastes contain plastics, which when burnt generate carcinogenic vinyl chloride monomers and dioxins (gas).

A survey conducted on the residents around the dump site during the JICA study (1998) revealed that there are serious complaints about smoke, smell and broken glasses. Respiratory and stomach problems among children are common in the nearby clinics and were cited by the people interviewed. School children passing through the dumpsites often picked objects which were dangerous to their health. Solid waste in the city is not

segregated, with the exception of unstructured reuse of some waste materials at the household level.

The NCC budgets enormous amounts of funds on recurrent and development expenditures on solid waste management but the problem still persists. This is because the NCC lacks a solid waste management policy and framework that would aim at improving the standards, efficiency and coverage of waste (Ikiara et. Al, 2004).

This study is therefore aimed to establish the mechanisms and strategies that the NCC has put in place to enable the residents of Dandora to take control of the problems of pollution brought about by the dump site.

1.3. Purpose of the Study

The purpose of this study is to establish human adjustment to solid waste pollution in Dandora dump site. JICA (1998) conducted a survey that revealed that there are complaints about smoke, pungent smell and broken glasses and increased of respiratory and stomach problems among children.

1.4. Objective Study

The general objective of this study is to assess the contribution of the community and government in trying to combat the pollution problem in Dandora.

1.4.1. Specific Objectives

1. To establish the extent Solid waste pollution has impacted on the lives of the residents of Dandora

2. To find out the perception and attitudes of the residents of Dandora towards Solid waste management problems
3. To identify and appraise community mechanisms for solid waste management with the aim of suggesting more guidelines.

1.5. Scope and Limitations

The study seeks to explain the adjustments made by the people of Dandora. The major concern is to highlight the magnitude of solid waste pollution and its impact on the residents of Dandora. The study will only be limited to Dandora because Dandora dump site is the only official NCC managed; hence all the waste collected in the city is dumped in this area.

1.6. Justification of the Study

Solid waste management (SWM) has not been adequately researched on hence it is at this perspective the researcher sought to establish linkages between solid waste and human adjustments. The problem in Dandora area has received a lot of attention from political circles and media. For several years there have been campaigns to have the dump site relocated to Ruai area on the outskirts of Nairobi. There are not clear methods established in a bid to control the level of pollution brought about the solid waste in Dandora and its environs. As a first step to achieve this there is need to assess the extent solid waste has impacted on the residents of Dandora in order to develop sustainable SWM programmes.

Therefore it is important to examine the best ways individuals and organizations can get involved in sustainable management of solid waste management in Dandora.

1.7. Definition of Terms

| | |
|------------------------|---|
| Dump site | Area where waste is hipped together in a landfill |
| Land fill | Putting waste together in a open field |
| Scavengers | Young and old people who work together in a dumpsite |
| Solid Waste Management | Management of waste |
| Waste pickers | Garbage collectors |
| Well service | Efficient garbage collection |

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter contains a review of literature that have been carried out on solid waste pollution and some of the theoretical framework. Solid waste pollution is not only a problem in Kenya alone but it is a world wide problem and especially in most developing countries. The fast expansion of urban, agricultural and industrial activities spurred by rapid population growth has produced vast amounts of solid and liquid wastes that pollute the environment and destroy resources. Solid wastes in Nairobi are a by-product of a broad spectrum of industrial, service and manufacturing processes. Primary high-volume generators of industrial solid wastes include the chemical, petroleum, metals, wood, paper, leather, textile and transportation industries. Secondary smaller generators include auto and equipment repair shops, electroplaters, construction firms, dry cleaners and pesticide applicators.

Solid waste management is often weak due to lack of appropriate planning, inadequate governance, poor technology, weak enforcement of existing legislation and the absence of economic and fiscal incentives to promote environmentally sound development, UNEP, (2005). Hence pollution is not a new phenomenon. Pollution has been defined differently in different areas such as a contamination, toxic waste, effluence, littering and smog (www.webdirectory.com/pollution/waterpollution).

The atmosphere is dynamic system and absorbs various pollutants from natural as well as man-made sources, thus acting as a natural risk. In this study pollution is seen to be the

introduction of substances to the physical environment that would change the existing quality of natural processes that are essential to life on earth from desirable levels. The effects that are harmful especially in issues related to human, plants and animals health is of concern. There are different types of pollution which include air pollution, water pollution and land pollution.

Air pollution

Nairobi is faced with two major issues as far as the atmospheric environment is concerned; climate change and air quality. This is due to air pollution through vehicles, industries, emissions from the use of charcoal, firewood and also the composting waste for energy and other municipal sources. As a result high levels of particles and suspended particulate matter from dust and open burning of waste especially in the North, South, Central and Eastern parts of Nairobi. The residents are mainly exposed to foul smell from the dump area.

Air pollution is experienced when the atmosphere is mixed with foreign gaseous materials from the constituent of pure air itself. In most cases there is a lot of carbon and nitrogen cycles and finally as emergence of new chemical reactions of reactive and non biodegradable compounds. Studies have detected over 2500 additional chemicals in urban air. Most of the materials are considered air pollutants and other products of human activity such as green houses. Urban air pollution is seen to induce further global warming, acid rain, smog and ozone.

The major Air pollutants and their impacts

Suspended Particulate Matter

This is a mixture of solid and liquid particles suspended in the air. Suspended particulates are seen as dust, smoke, and haze which can make breathing difficult, especially for people with chronic respiratory problems.

Volatile Organic Compounds (VOCs)

VOCs include gasoline, paint solvents, and organic cleaning solutions. They evaporate and enter the air as vapour, and as molecules resulting from the incomplete burning of fuels and wastes. This affects many people who complain of headaches, nausea, allergies, etcetera as a result of inhaling the compounds.

Carbon Monoxide (CO)

Carbon Monoxide is emitted from vehicle. This is an invisible, odourless gas that is highly toxic to air breathing animals because it interferes with the blood's ability to transport oxygen. Even low levels can start or increase damage to the heart in individuals with artery or heart problems. At medium concentrations, CO causes headaches and fatigue. As the concentration increases, reflexes slow down and drowsiness occurs. Nairobi with the massive traffic jams contributes a lot of CO into the air the with very little use of unleaded petrol in vehicles, one wonders the extent of respiratory conditions/out there illnesses. Also greenhouse effect is caused by increased level of carbon dioxide.

Nitrogen Oxides (NOX)

Nitrogen Oxides are lung irritants that can lead to acute respiratory diseases in children. They may also cause over-sensitivity to pollen and dust in people suffering from asthma.

Sulphur Oxides (SOX)

Sulphur Dioxide is converted to sulphuric acid in the atmosphere. It can be poisonous to both plants and animals. Like particulates, sulphur dioxide irritates the respiratory track, causing airways to close and interfering with the lungs.

Lead and other heavy metals

Lead is dangerous, even at low concentration and can lead to reduce intelligence in children, brain damage and death. It accumulates in the body and damages body tissue. Heavy metal may be released into the environment from metal smelting and refining industries, scrap metal, plastic and rubber industries. On release to the air, the elements travel for large distances and are deposited onto the soil, vegetation and water depending on their density, (UNEP, 2007).

Ground Level Ozone

Ozone in the upper atmosphere shields us from ultraviolet radiation. However, on ground level, it is highly toxic to both plants and animals as it can damage lungs. It can bring on coughing; asthma attacks and lowers the immune system.

Fuel

Indoor air pollution is caused by the burning of fuel-wood and dung for cooking, and can cause suffocation.

Sources of Air Pollution

Motor vehicles

There are two main sources of air pollution are motor vehicles and industries. When they burn petrol, cars and trucks release significant quantities of sulphur dioxide, oxide of nitrogen, carbon monoxide, lead and suspended particulate matter. Lead is used in petrol to protect engines. Diesel powered cars produce large quantities of particulates in the form of black soot. Reduce use of private cars, proper legislation and enforcement of laws can curb this menace. Use of unleaded petrol or catalysts to breakdown the lead in petrol can be very effective. At the moment even our biggest refinery at Mombasa cannot process unleaded petrol.

Industry

Electrical power plants and industries emit particulate matter, sulphur oxides, nitrogen oxides, hydrocarbons and carbon dioxides. The top three industrial sources of toxic air pollutants are the chemical, metal and paper industries.

Municipal Solid Waste

When solid waste is burnt, heavy metal like lead, gases and soot are spread over residential areas. Rubbish, dust and gases found during the decomposition of waste, all contribute to air pollution.

Smog

When air pollution in urban areas reduces visibility it is often called smog. There are different types of smog. Smoke pollution from industries is sometimes called industrial

smog. The pollutants it contains are sulphur oxides and particulates, photochemical smog is a brownish orange haze formed by chemical reactions involving sunlight.

Medical Waste

Burning medical waste is a serious source of air pollution, particularly in cities. Most incinerators are rudimentary by today's standard. They burn waste incompletely, releasing acidic gases, heavy metals, and dioxins into the air.

Water Pollution

The natural ground water quality is generally good and reaches the drinking water standards for most constituents, except for fluoride which often exceeds 1mg/l (Foster and Tuinhof , 2005). Surface water on the other hand is heavily polluted with a variety of pollution such as agro-chemicals, heavy metals, microbial as well as persistent organic pollution (UON/ UNEP 2005). Disposal of untreated waste from domestic, commercial and industrial premises into unprotected surface water courses and wet land areas also pollutes subsurface water posing a danger to human health and leading to eutrophication, deoxygenating and habitat modification of the riverine system. A good example is the polluted Nairobi river, no living organism can survive in those waters due to chemical pollution from industries.

Sources of surface and Ground Water Pollution

Municipal Sewage

Municipal sewage is a major source of pollution. About 2million wet tones of human excreta are annually produced in the urban sector of which around 50% go into water bodies to pollute them. National Conservation Strategy (NCS) states that almost 40% of

the deaths are related to water borne diseases. Domestic wastewater collects on the streets and in low lying areas. The situation is further aggravated by the addition of untreated wastes from Small scale industries (www.iw.pca.org).

Industries

Industrial wastewater contains toxic chemicals. It is alarming that most industries have been started without proper planning and water treatment plants. They just dispose of untreated toxic waste into nearby drains canals or rivers such as Nairobi river. Untreated oil, grease and dirt find its way into nearby canals and rivers where it damages and ecosystem (www.iw.pca.org).

Landfills & Leaching

‘Leaching is the process where chemicals from a material dissolve into water while it is being filtered through that material’ the resulting mixture is called leachate consisting of residues from decomposed organic materials and metals.

Major contributors to leachate are municipal solid waste, hospital waste, chemical fertilizers, pesticides, stagnant ponds, toxic industrial waste and sewage. Rusting cans, discarded batteries and appliances, paints, pesticides, cleaning fluids, newspapers inks, and other chemicals, may also add to the toxic mixture of leachate.

Agriculture

Excessive and uncontrolled use of chemical fertilizers and pesticides promotes contaminated agricultural run off. This not only pollutes the surface drains but the waste trickling down to lower layers of soil causes a severe contamination of the natural aquifer.

Over abstraction of ground water prompts recharge from the surface water drains, which themselves are severely contaminated. Further, intensive agriculture, dependent on high levels of fossil fuels combustions and the widespread cultivation of leguminous crops is releasing huge quantities of nitrogen to the environment, exacerbating acidification causing change in the species composition of ecosystems, raising nitrate levels in fresh water supplies above acceptable limits for human consumption, and causing eutrophication in fresh water and marine habitats.

Water Pollution and Humans

WHO (2002) reports that 25-30% of all hospital admissions are connected to water borne bacterial and parasitic conditions, with 60% of infant deaths caused by water infections. The long term effects on human health of pesticides and other pollutants include colon and bladder cancer, miscarriage, birth defects, deformation of bones and sterility. Contamination of fresh water with radio nuclides, which can result from mining testing disposal and manufacturing of radioactive materials as well as transportation accidents, has led to increased incidences of cancer, developmental abnormalities and death. Cesspools of stagnant dirty water, both in rural and urban areas, account for a large number of deaths caused by potentially fatal diseases like cholera, malaria, dysentery and typhoid. Nitrate concentration in water above 45mg/l makes it unfit for drinking by infants. The nitrates are reduced in body to nitrites and causes serious blood condition called 'Blue baby syndrome.' Higher concentrations of nitrate cause gastric cancer. Untreated and highly toxic industrial sewage is also used for irrigation near major cities. This can contaminate crops and consequently affect consumers.

Water Pollution and the environment

Untreated wastewater from domestic sewage and industrial estate when discharged into the rivers, dams and sea. There is also water pollution as a result of use on nitrogen fertilizers when cultivating and farming hence this nitrogen is mixed to form nitrate which contaminates ground water. This waste poses a serious threat to the marine environment as channel water is contaminated not only with bacteria's but also with toxic chemicals. Animals drink this water and marine such as fish and birds life around the river has migrated to other areas. Survival of small invertebrates, micro fauna and flora is also threatened. This is also threatens human being because of high consumption of contaminated water that can cause to get sick.

Land pollution

This is also referred to as soil pollution. Land pollution comes in many forms. Solid waste, such as trash from human activities, is one obvious form. Pesticides, and the residues that remain in the soil are another. Radioactive materials and other forms of hazardous wastes make up a third. All of these forms of pollution are a direct result of more people using more resources. The increased production of materials goods, the need for more and more raw materials, and increased food demands have all helped contribute to the problem of land pollution.

Every living thing produces waste. Trees drop leaves and fruit, insects, shed their exoskeleton and animals produce waste and eventually die. These wastes are called biodegradable since they can be broken down by living things such as earthworms, bacterial, insects, and molds. There was a time when the earth was able to keep up with the wastes. However, as more people live in smaller areas, natural processes are not sufficient

to keep up with waste production. In addition, humans have manufactured new types of waste materials such as plastic glass, and waste materials from the production instance, plastic glass have no natural process by which they return to the soil, scientists indicated that the consequence of these developments are unknown. Most of the paper bags produced in Kenya are less than 30microns and hence they should not be allowed and the thicker ones are among a draft of proposals aimed at reducing the use of polythene bags and providing funds for alternative, more environmentally, friendly, carriers such as cotton or sisal bags.

2.2. Theoretical Framework

Theory is the conclusion around which the research revolves. According to Swingewood (2000) as quoted by Father Ndikaru he describes sociological theories as devoted to mapping, describing and explaining social relations as they actually are, as they actually occurred, rather than they ought to be. Further a theory is a set of interrelated constructs (variables) definition and propositions that represent a systematic vie of phenomenon, by specifying relations between variables, with the purpose of explaining natural phenomena (Kerlinger, 1964). Theory establishes a cause and effect relationship between variables with the purpose of explaining and predicting phenomena and may indicate missing ideas, or links to the kind of data required.

Sustainable Development

The opportunity for a strategic approach to national development. There has been unprecedented progress in development over the past 30 years. Life expectancy in developing countries has risen by more than 20 years, infants mortality rates have been halved and primary school enrolments rates doubled. Food production and consumption

have increased around 20 percent faster than population growth. Improvements in income levels, health and educational attainment have sometimes closed the gap with industrialized countries. Advances have been made in the spread of democratic participatory governance and there have been forward leaps in technology and communications. New means of communications support opportunities for mutual learning about national development processes and for joint action over global challenges.

The world summit for Sustainable development (WSSD) held in Johannesburg in August/September (2002) focused minds and attentions on the challenges of sustainable development. It took stock of progress since 1992 and sought ways in which to make progress through real behaviour change and not merely in aspirations and exhortations. NSDS offer a key set of processes and mechanisms to help achieve this goal.

The WSSD preparatory process and associated events and activities provided an unprecedented opportunity to recognize the difficulties and grasp the chance to make a serious commitment to sustainable development through NDSs. But just negotiating agreed accords and communiqués as in the past will be insufficient. Given the progressively deteriorating environmental and social trends, there is need for genuine political commitment for taking action to establish in each country the environment in which stakeholders can engage and effectively in debate and action to develop real partnerships between government, the private sector and civil societies; to agree on roles and responsibilities for sustainable development, to establish effective coordination mechanisms and to work together on agreed priorities.

The Challenges of Environment and Development

There are many urgent challenges and negative trends which remain to be overcome as well reviewed and regular global assessment initiatives. Although these tend to focus on environmental, social and economic concerns they increasingly adopt a more holistic approach. These challenges include economic disparity and political instability, extreme poverty, under nourishment, diseases, marginalization, population growth, consumption, global energy use, climate change, nitrogen loading, natural resource deterioration, loss of diversity, pollution and growth water scarcity. Other urban problems include continuing urbanization and industrialization combined with lack of resources and expertise and weak governance, are increasingly the severity of environmental and social problems. This reinforces one another in densely populated areas. Air pollution, poor solid management, hazardous and toxic wastes, noise pollution and water contamination combine to turn these urban areas into environmental crisis zones with children from poor household being the most vulnerable to the inevitable health risks.

Responses to the Challenges of Sustainable Development

There is an emergence of sustainable development as a common vision, UN conference, 1972 of Human Environment in Stockholm which in turn led to the creation of UNEP and IIED. These bodies were supposed to help in response to increasingly informed analyses of the links between environment and development. The world conservation strategy emphasized the need to mainstream environment and conservation values and concerns into development processes. These were followed by multilateral environmental agreements (MEAs) a few historic international environmental treaties which were signed many decades ago, such as the 1900 convention for the Preservation of Animals, Birds and Fish in Africa. These were mainly single issue sectoral agreements and legislation, addressing

allocation and exploitation of natural resources such as wildlife, air and the marine environment. There was also the environmental monitoring and assessments-in the last two decades, a wide array of monitoring regimes have been established to track environmental changes, some connected to the MEAS described above such as UNEP working in partnership with various UN organizations to coordinate terrestrial, oceanic and climate observation systems. There have been a number of regional assessments of the state of environment, and of challenges to sustainable development. A report by Southern African Development Community (SADC), SARDC, 1994) examined the natural resources of the region- particularly ecological zones shared by countries- provided details of the most serious environmental issues, and discussed the impacts of global warming and scenarios for the future of the region.

Other benefit include economic instruments, sustainable development entails private, individuals, corporations and communities behaving in ways that will balance private benefits with public benefits such as securing environmental services or improving equity. Regulations are only partially effective in this. Earth Summit (1992), stressed the need for economic incentives to promote more sustainable patterns of production and consumption and to generate resources to finance sustainable development. Engaging the private sector in many countries, is seen as some progress towards more sustainable business, with companies committed to sustainable development strategies through partnerships with customers, suppliers, government and NGOs and the general public. Appropriate policies responses remain few and more concerted action is still required to achieve sustainable production and to encourage consumers to embrace sustainable consumption patterns.

New technologies should also be embraced as the concept of cleaner production, involving re-designed products and production processes intended from the outset to minimize resource use, waste and harmful emissions. Many industries in developed countries have established clean production methods on a voluntary basis. (UNEP, 1994).

It was agreed in 1992, at the Earth Summit, that financing sustainable development was required to implement. Some resource might be provided by each country's public and private sectors, but it was agreed that low-income countries would require substantial additional funding through official development of Agenda 21 on national strategies for sustainable development.

There is also need for sustainable development balances needs from local and global levels with good governance and the twin trends of decentralization and globalization. It is importance to recognize that the architecture and operation of governance systems at different levels differ between countries as well as the meaning of terms such as national, provincial and district thus the process of governance are changing.

To achieve sustainable development we require deep structural changes and new ways of working in all areas of economic, social and political life. Economic growth patterns that actively favour the poor should be promoted. Fiscal policies that negatively affect the poor or promote environmental damage will need to be reformed. Issues of inequity and inequality of access to assets and resources need to be confronted in a more open and progressive manner such as land tenure policies to increase access to resources for the disadvantaged and marginalized groups. It is also important to build and strengthen social capital and to devise formal safety nets to enable vulnerable economies and group of

citizens to better cope with both external and domestic shocks this include price fuel, food, environmental degrading and many other factors. Sustainable development has therefore important governance implications that by integrating mechanisms that can engage the governments, civil societies and private sector in developing shared visions, planning and decision making.

Functional Theory

According to Ritzer (1992: 239), Functional theory explains social institutions primarily in terms of the operation. Today the names of Emile Durkheim (1858-1917) and Talcott Parsons (1902-74) are synonymous with functionalism. Parsons and Durkheim's views are that a society is that is as a set of interconnected parts, which together form a whole. Durkheim emphasis the importance of viewing society as whole and inter-relationship of society in terms of the functions they perform. According to Parsons, (1951:153) every society in order to exist must solve four problems: adapting to the environment; that is the community that cannot feed its member is bound to collapse. Secondly providing a decision making process, which is a goal attainment, each society must have a means to decision-making process and deciding how it will be organized. It is necessary to motivate member of the community to want to do what they have to do. The community must define and attain its primary goals.

Integrating the various institutions to specific needs of the community means that a community regulates the interrelationship of its component parts. Fourthly, the pattern maintenance (latency) that the community must furnish, maintain and renew both motivation of individual and create cultural patterns that create and sustain the motivation.

What Talcott is saying is that, to cope with the psychological demand of the community member, which are the needs to motivate individuals to remain within the society.

With this functional theory, it will help to understand the residents of Dandora. They live as a community which is an institution of families and have stratified community. The community consists of employers and employees. Most of these employees are children, middle age men and women. Children drop out of school to work in the dump site in order to make quick money, access food, peer influence, poverty and HIV/AIDs.

Quick money- the children can earn between 200 to 400 per day from the selling of recycling plastics and metals.

Access to food: food disposed at the dump site from large hotels, airlines and export companies is easy source of food for children working at the site.

Peer influence: there are young children who have been influenced by their elder siblings and friends to drop out of school and work at the site.

Poverty: Embakasi Division hosts one of the poorest estates and slums in the city. Families afflicted by poverty move to work at the dump site.

HIV/AIDS: children affected by HIV/AIDs scourge are pushed to the site to work and survive in Nairobi. Some of the children working at the site have to pay their house rent and provide for other siblings in the family.

Use of Economic Instruments for Solid Waste Management in Kenya

Solid waste management in Kenya has largely relied on command and control strategies, an approach that has proved to be inefficient as evidenced by the mountains of uncollected or illegally dumped solid waste. The use of economic instruments for solid waste management is not well established although some use of economic instruments for solid waste management instruments are used to a limited extent. These include user charges; financial instruments—subsidies and licences; fiscal instruments—imports duty waiver; deposit-refund systems; property rights; institutional reforms and regulations. In addition, although the private sector has been participating in the service of waste collection, transportation and disposal without any policy or legal/regulatory provisions, the Environmental Management and Co-ordination Act of 1999 (EMCA, 1999) and policy development efforts by the Nairobi City Council (NCC) promise to make privatization a leading economic instrument for the management of solid wastes in the country. EMCA (1999) provides for “taxes and other fiscal incentives, disincentives or fees to induce or promote the proper management of the environment and natural resources or the prevention or abatement of environmental degradation”. Without prejudice to the generality of sub-section the taxes and fiscal incentives, disincentives or fees may include: Customs and excise waiver in respect of imported capital goods, which prevent or substantially reduce environmental degradation caused by an undertaking. Tax rebates to industries or other establishments that invest in plants, equipment and machinery for pollution control, re-cycling of wastes, water harvesting and conservation, prevention of floods and for using other energy resources as substitutes for hydrocarbons; tax disincentives to deter bad environment behaviour that leads to depletion of environmental resources or that cause pollution; user fees to ensure that those who use environmental resources pay proper value for the utilization of such resources.”

EMCA (1999) has, however, not been fully operationalized and some of these economic instruments have not been applied. Notably, though, the National Environmental Management Authority (NEMA) is spearheading efforts to operationalize the application of economic instruments. In the remainder of this section, economic instruments that have been used in the management of solid wastes in the country are briefly reviewed, where possible highlighting the experience.

Non-Revenue Economic Instruments

Product life cycle assessment, which predicts overall environmental burden of products and can be used in certification programmes; deposit-refund, deposit paid and refund given upon product return for reuse; take-back systems, where manufacturers take back used products or packaging; procurement preferences, evaluation criteria adding points for products with recycled content or reduced resource demand; eco-labelling, which notes product's recyclable content and whether product is recyclable; recycled content requirements, laws and procurement specifications noting the precise recycled content required; product stewardship, which encourages product designs that reduce pollution, include the full cost of solid waste recycling and disposal, reduce wastes and encourage recycling; disclosure requirement, in which waste generators are required to disclose their pollution; manifest systems, precise cradle-to-grave tracking of hazardous wastes; blacklists of polluters, published lists enable consumers to consider whether to buy from polluting companies; liability insurance, liability assurances by contractors and private operators; bonds and sureties, guarantees for performance by contractors and private operators; performance-based management contracting where oversight contractors commit to overall service improvements; and clean city competitions which reward neighbourhoods and cities that have improved cleanliness.

The private waste collectors charge a fee ranging between Kshs.200-600 per month per household, to collect the waste twice a week. The firms provide polythene bags free of charge to the households to store the waste. The private waste collectors who serve the commercial/industrial sector provide a bulk container at a fee of Kshs.2000 per big container per collection, and Kshs.250 per 200 litre drum and 70-litre polythene bag per collection respectively.

The main advantage of the user charge is that collection of revenue is relatively easy and cost effective for the council since the collection charges are tucked in the water bills. For the private waste collectors, the collection is made easy by the willingness to pay by the consumers, (households, commercial and industrial enterprises).

There are many disadvantages too, however, with the way the user charge is currently designed. These include: being a standard charge, it does not target the amount and pollution content of waste generated. It does not encourage recycling because it has no provision for segregation of waste at source. Private sector waste collectors encourage the principle of exclusion because they target only those who are willing and have the ability to pay. They therefore target high and medium income estates. Even in these areas, there are still some people who cannot pay, which reduce the system's effectiveness. Selection, design and implementation of economic instruments in the Solid Waste Management Sector in Kenya

Exchange Theory

The exchange theory is where people transfer economic goods or services. It is when any social interaction on aspect of exchange of goods and services, that is serve the purpose of social bonding. In analyzing exchange theory, George Simmel (1858-1918) describes it in the context of social systems. These are contacts among people for giving and returning the equivalence (Ritzer, 1992). He articulates in his book: 'Conflict and the Web of the Group Affiliations' (1955) that the medium of exchange is money. Simmel presented society as a 'Web of interactions, people interact due to what they do, especially due to economical factors.

Simmel looks at exchange as universal form of interaction, not all interactions is exchange, so he talks on economic exchange meaning money exchange involves money but money remain historically a major medium of exchange. George Homans (1910-1989) who is the leading exchange theorist integrated the theory into his largely behaviourist approach. Exchange theory constitutes an effort to take the principles of behaviourism, fuse them with other ideas. Society plays a variety of roles in exchange process, where there is scarcity; society must intervene to provide roles to conduct so as survive. Homans views, an individual enters into a social exchange in relation with the primary purpose of profiting from it.

Communities in Dandora are from different parts of the Republic of Kenya. They have come to Dandora looking for houses. As such the workers have to exchange their services for wages and other employment benefit. The employers need their services in exchange of money. It is through exchange of service and money that the industries in Eastland's have survived. The owners of capital and producers have to agree on what to give and what to

get. There is a mutual understanding of both, the employers and employees. No conflict or crisis may arise if there is mutual understanding and both parties' interests are addressed.

Conflict Theory

According to Karl Marx (1818-83) all social systems reveals inequalities in the distribution of resources. The class consciousness eventually transforms into class conflict. To him, foundation of class is the division of society into the have and the have notes. These are the owners and non-owners of the society's productive instruments. It was the class conflict between bourgeoisie (owner of the capital) and the proletariat (exploited), which was to propel society on to its next historical stage socialism. Strain development between owners and workers and conflict-in form of class struggle cannot be avoided.

Marx formulated the idea of thesis, which conflict with antithesis resulting in synthesis which will result to change. Conflict according Marx is natural, because it is a normal and cannot be avoided as means of change. It should be noted that Marx dwelt so much on material aspect, saying that people behave that way due to material. But there are other factors, which makes people behave the way they behave, like education or religion.

Communities in Dandora are mostly workers in the industries. The employers have their own interest, which is to the maximum profit, while the workers need money for their survival. Since the two parts have different interest, they're bound to conflict. Each group wants to get the most of their interest from the other. The employers and workers will have conflict that will result with disagreements.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter dealt with the research design for the study. According to Nachmias and Nachmias (1996:99), research design was the blueprint that enables the investigator to come up with solutions to research question and problems, and guides him/her in the various stages of research. The purpose here was to describe the process involved in designing the study and to demonstrate how the researcher collected, analyze and interpret the data. The chapter covered site selection and description, unit of analysis, sampling procedure, data collection methods and analysis.

3.2 Site selection and description

The study was carried out in Dandora, Nairobi, the capital city of Kenya, within the Nairobi City Council dump site. Dandora has an estimated population of 110,164 (Central Bureau of Statistics, 2006:32). Dandora has a land area of 4square kilometers and approximately 27,541 persons per square kilometer. Nairobi has a land area of 696 square kilometers and approximately 3,079persons per square kilometer. Therefore with the population density in Nairobi being quite high and continuing to rise, there is a high production of solid waste pollution. Dandora is located East of the city in Embakasi Division and borders Kasarani Division to the North, a division which comprises poor neighbourhood such as Korogocho and Kariobangi. The three neighbourhoods of Dandora, Kairobangi and Korogocho are estimated to host over a quarter of a million residents (Residents Memorandum to the Government of Kenya, 2005). However, the study is

restricted to Dandora phase one since there is a high population and also being the only designated dumpsite by the Nairobi City Council.

The study targeted residents of Dandora phase one. Respondents aged 18 years and above, both male and female, were interviewed. The reason for the age limit was for the study to targeted respondents who were in a position to make decisions concerning solid waste management. City council official who are the supervisors of the dump site management will also be involved. The scavengers were also involved to be able to give us first hand information on the waste management and pollution involved in the dump site.

3.3 Unit of analysis and observation

According to Singleton the entities (objects/events) under study are referred to in social research as units of analysis (Singleton, 1998: 69). Nachmias and Nachmias (1996: 53) define the unit of analysis as the most elementary part of the phenomenon to be studied. In this study the unit of analysis was the solid waste management represented by Dandora dump site. The units of observation are how residents of Dandora phase one who live next to the dumpsite and other areas in the city dispose their solid waste from their both their households, industries, and other areas.

3.4 Sampling design

This study adopted both probability and non-probability sampling techniques. Nairobi province has 8 districts namely Embakasi, Westlands, Langata, Central, Dagoretti, Kasarani, Starehe and Kamukunji. Dandora is situated in Embakasi division, Embakasi District. The residents of Dandora phase one (1) will be included in this study since this is

where the dumpsite is located although neighbouring phase four (4) on the east and Korogocho on the north.

3.5 Data collection methods and instruments

3.5.1 In-depth interviews

This was done to obtain information from key informants. It involved in-depth discussions using a key informant guide, covering several specific topics concerning health service provision. This enabled the researcher to carry out discussions on a wide range of issues covering the topic under study.

3.5.2 Structured interviews

Structured interviews are interviews where the sequence in which the questions are asked is the same in every interview, and the number of questions and the wording of the questions are similar for all the respondents (Nachmias and Nachmias 1999:234). The research instrument which was used here is an interview schedule, which included both closed and open-ended questions. Its purpose was to establish the perception of the respondents on quality of health services provided. The questions were developed based on the literature reviewed, problem statement and objectives of the study.

3.5.3 Observation

The researcher made observation and record the physical infrastructure, equipment used in collection of solid waste.

3.6 Data analysis

The collected data was analyzed and interpreted. Closed-ended questions were coded to enable all the responses to be keyed into the computer. Data was analyzed using the Statistical Package for Social Scientists (SPSS). Descriptive statistical procedures used to describe the distribution and derive patterns from the data. These were in percentages, frequency distribution tables, cross tables and pie charts. Part of the qualitative data was analyzed as it is being collected. It was in the form of field notes. Analysis involved reducing, selecting and transforming it into relevant themes.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1. Introduction

This chapter presents a descriptive analysis of the data gathered in relation to the human adjustment to solid waste pollution: a case study of Dandora area in Nairobi. In this study, a total of 68 respondents were interviewed. The respondents were randomly selected from the five phases of Dandora. The method employed assured an equal chance of representation of all the phases within the division.

Descriptive techniques were used to organize, summarize and interpret quantitative information. Data was then presented in form of frequency tables and charts where applicable. This presentation is based on the questionnaire that was administered.

4.2. Background characteristics of the respondents

This section presents the characteristics of personal attributes of individual respondents. They include; gender, age, marital status, family size, level of education, income and occupation. The rationale behind inclusion of these attributes in the analysis is that they help to shed some light on the type of residents who stay in Dondara.

Table 1: Distribution of Respondents by their Gender

| | Frequency | Percent |
|--------------|-----------|--------------|
| Female | 23 | 33.8 |
| Male | 45 | 66.2 |
| Total | 68 | 100.0 |

Source: Field Data

Majority (66.2%) of the respondents indicated that they were male and only 33.8% of the respondents who were female. Hence more male were available to the interview than female.

Table 2: Distribution of the Respondents by their Age

| | Frequency | Percent |
|--------------|------------------|----------------|
| 15-20years | 12 | 17.6 |
| 21-26years | 24 | 35.3 |
| 27-32years | 12 | 17.6 |
| 33-38years | 7 | 10.3 |
| 39-44years | 5 | 7.4 |
| 45-49years | 6 | 8.8 |
| 50 and above | 2 | 2.9 |
| Total | 68 | 100.0 |

Source: Field Data

Most of the respondents (35.3%) were aged between 21-26years, 17.6% of them indicated they were aged between 15-20 years and 27-32years of age while 10.3% of the respondents indicated that they were aged between 33-38 years, 8.8% of the respondents indicated that they were aged between 45-49 years, 7.4% of the respondents indicated that they were aged between 39-44years and only 2.9% of the respondents indicated that they were aged between 50 years and above.

Table 3: Distribution of Respondents by Highest Level of Education

| | Frequency | Percent |
|---------------------|------------------|----------------|
| College | 21 | 30.9 |
| Secondary | 29 | 42.6 |
| Primary | 15 | 22.1 |
| No formal Schooling | 3 | 4.4 |
| Total | 68 | 100.0 |

Source: Field Data

Majority (42.6%) of the respondents indicated that they had attained secondary level of education, 30.9% of them indicated that they had attained college level of education, while 22.1% of them indicated that they had attained primary level of education and only 4.4% of the respondents indicated that they had no formal schooling.

Table 4: Distribution of Respondents by their Marital Status

| | Frequency | Percent |
|--------------|------------------|----------------|
| Married | 33 | 48.5 |
| Single | 33 | 48.5 |
| Divorced | 1 | 1.5 |
| Widowed | 1 | 1.5 |
| Total | 68 | 100.0 |

Source: Field Data

Most (48.3%) of the respondents indicated that they were married and single and 1.5% of the respondents indicated they were divorced and widowed respectively.

Table 5: Distribution of Respondents with their Monthly Income

| | Frequency | Percent |
|---------------------|------------------|----------------|
| Below Kshs.5000 | 35 | 51.5 |
| Kshs.5000-10,000 | 18 | 26.5 |
| Kshs.11000-15000 | 9 | 13.2 |
| Kshs.15,000 & above | 4 | 5.9 |
| No Response | 2 | 2.9 |
| Total | 68 | 100.0 |

Source: Field Data

Majority (51.5%) of the respondents indicated that they were earning a basic salary of Kshs5000 a month while 26.5% of them indicated they were earning Kshs.5000-10000, 13.2% of the respondents indicated that they earned Kshs.11000-15000 a month while only 5.9% of the respondents who indicated that they earned a salary of kshs.15,000 and above. This shows that most of the Dandora residents are low-income earners.

Table 6: Distribution of Respondents by their Occupational Status

| | Frequency | Percent |
|--------------------------|------------------|----------------|
| Public/ Private Employed | 15 | 22.1 |
| Self Employed | 39 | 58.3 |
| Unemployed | 13 | 19.1 |
| Students | 1 | 1.5 |
| Total | 68 | 100.0 |

Source: Field Data

Majority (58.3%) of the respondents were self-employed while 22.1% of them working in public offices. 19.1% were unemployed and 1.5% of them were students. This shows that majority of the residents are self-employed commonly known as 'Jua Kali' sector. The other side could also be that while we did the survey on a weekday, majority of the ones in public offices were at their work places.

4.3. To establish the extent Solid Waste Pollution has impacted on the lives of the residents of Dandora.

Globally there is a tendency for landfills to be located in poor neighborhoods. It is a power game and so poor neighbourhoods are the route of least resistance (Pellow, 2002) as quoted by Ikiara (2006). This then causes pollution of the air, soil and water. The researcher therefore, wanted to know the extent to which solid waste pollution had impacted on the lives of the residents of Dandora. This can be divided into three categories which include socially, economically and health wise. The researcher looked at all the factors that impact either positively or negatively to the lives of the residents of Dandora.

Table 7: Distribution of Respondents by Awareness of Pollution problem in Dandora

| | Frequency | Percent |
|--------------|------------------|----------------|
| Yes | 61 | 89.7 |
| No | 7 | 10.3 |
| Total | 68 | 100.0 |

Source: Field Data

Social Impact

The researcher enquired some of the factors that the residents felt contributed to social impact in Dandora pollution. They rated both positive and negative factors that contributed to the social impact of the Dandora dumpsite. The results are as shown in the table below.

Table 8: Distribution of Respondents with factors that Contribute to Social Impact

| Impact | Frequency | Percent |
|--------------------------|-----------|------------|
| High rate of crime | 15 | 22.1 |
| High school drop out | 15 | 22.1 |
| Water Supply | 10 | 14.7 |
| Market is not stimulated | 10 | 14.7 |
| Increase Poverty | 10 | 14.7 |
| Sanitation | 8 | 11.8 |
| Total | 68 | 100 |

Source: Field Data

About 22.1% of the respondents felt that the dumpsite had contributed negatively in their lives because of the high rate of crime, which has also witnessed some of the most dangerous groups like *Mungiki* control the dumpsite. The site also provides safe haven for criminals who operate from the site, using it as a hiding place and a crime strategizing point. 22.1% of school going children opted to drop out of school to scavenge at the dumpsite so as to earn a living from the materials they got while 14.7% of the respondents also indicated that there was a problem in supply of clean water in the area, a market could not be able to operate next to dump site since the area was perceived to be unhealthy. The Nairobi River that is heavily contaminated passes through the dumpsite and some residents

use it to grow vegetables that have been seen to have high levels of toxic substances like lead. Only 11.8% of the respondents who felt that there existed a sanitation problem since the sewerage system was also within the dumpsite and sometimes it went untreated hence contributing to a foul smell that affected the residents of the area. When the scavengers were interviewed they indicated that there were no criminals found in the dumpsite since they (the scavengers) knew each other and when new comers came along they were answerable to them first before being allowed to the dumpsite so as not to create problems to them (the scavengers with the police).

In most cases the researcher found out that the high rate of school drop out is due to reasons such as quick money where children who drop out of school are able to earn between Shs.200-400 per day from the selling of recycling plastics and metals. In some cases sweets and chocolates dumped by companies found their way to the surrounding schools (numbering 20 primary schools and a number of secondary schools) and sold at the gates of the schools to children. Access to food;- food disposed at the dump site from large hotels, airlines and export companies, are consumed by children working in the site and in the surrounding residential areas. Hygiene is not observed and sometimes the food has expired, this puts the lives of the residents at risk. Peer influence- young children have been influenced by their elder siblings ,friends and even parents to drop out of school and work at the site exposing them to social vices like thuggery to survive, are easily lured to join criminal groups 'controlling' the dumpsite. Poverty -Embakasi Division hosts one of the poorest estates and slums in the city called Korogocho. Families from this slum afflicted by poverty encourage their children to go to the dumpsite to fend for themselves and also support their families. HIV/Aids; children affected by HIV/Aids scourge are pushed to the

site to work and survive in Nairobi. Some of the children working at the site have to pay their house rents and provide for other siblings in the family.

Economic Impact

Solid waste management in Kenya has largely relied on command and control strategies, an approach that has proved to be inefficient as evidenced by the mountains of uncollected or illegally dumped solid waste. The use of economic instruments for solid waste management is not well established although some use of economic instruments for solid waste management instruments are used to a limited extent. In cities of developing regions as much as 70% of waste is organic material. Not only is this a reclaimable resource in itself, but recycling can also reduce demand for valuable and scarce landfill space. In addition the compost from the recycled material can be treated like a source of income although not enough. With this in mind the researcher embarked on find out the economic impact of the Dandora dumpsite to the residents.

Table 9: Distribution of Respondents and Economic Impact

| | Frequency | Percent |
|-----------------------|------------------|----------------|
| Composting | 30 | 44.1 |
| Recycling of Plastics | 26 | 38.2 |
| Recycling of Metals | 6 | 8.8 |
| Discarded fish | 4 | 5.8 |
| Glass | 2 | 3.0 |
| Total | 68 | 100 |

Source: Field Data

Most of the respondents (44.1%) indicated that they did compost since it could earn them a living to be sold to farmers within the city. Apart from farming, other compost outlets such as horticulture, tree nurseries, parks, cemeteries, lawns and playgrounds should be pursued to expand market for composts. 38.2% of them indicated they dealt with companies that recycled of plastics like Kenpoly and Premium Drums who buy waste plastic, while 8.8% indicated that they dealt with recycling of metal. 5.8% of the respondents indicated they collected with discarded fish, which they later sell to some companies that recycle and produce fertilizer and animal feed. 3.0% of the respondents indicated that they collected glass, which they sell to glass recyclers like Central Glass Industries who buy glass bottles.

The use of economic instruments for solid waste management is not well established although some use of economic instruments for solid waste management instruments are used to a limited extent. These include user charges; financial instruments—subsidies and licences; fiscal instruments—imports duty waiver; deposit-refund systems; property rights; institutional reforms and regulations. In addition, although the private sector has been participating in the service of waste collection, transportation and disposal without any policy or legal/regulatory provisions, the Environmental Management and Co-ordination Act of 1999 (EMCA, 1999) and policy development efforts by the Nairobi City Council (NCC) promise to make privatization a leading economic instrument for the management of solid wastes in the country. In developed countries of Europe compost is used as a source of power generation.

Health Impact

A high concentration as is the case in polluted environments, results in public health deterioration. This occurs when heavy metals are released in the environment from metal

smelting and refining industries, scrap metal, plastic and rubber industries. Upon release of these metallic to the air, the elements travel for large distances and are deposited or degraded. They persist in the environment for many years poisoning humans through inhalation, ingestion and skin absorption. The researcher wanted to know some of the health impacts that are caused by pollution of the air by such heavy metals and other substances from burning of materials and rotting.

Table 10: Distribution of Respondents and Health Impact

| | Frequency | Percent |
|--|------------------|----------------|
| Respiratory tract irritation | 49 | 72.1 |
| Nausea, anorexia, vomiting, gastrointestinal abnormalities and dermatitis | 7 | 10.3 |
| Gasto-Intestinal disorders, renal failure & neuro-toxicity | 6 | 8.8 |
| Irritation of lungs and gastro intestinal tract, kidney, damage, abnormalities of the skeletal system and cancer of the lungs and prostate caused by cadmium | 4 | 5.8 |
| Impairment of neurological duet, suppression of the hematological system and kidney failure | 2 | 3.0 |
| Total | 68 | 100 |

Source: Field Data

Majority (72.1%) of the respondents indicated that they had a problem with their respiratory tract while 10.3% of the respondents complained of nausea, anorexia, vomiting, gastrointestinal abnormalities and dermatitis, 8.8 of the respondents indicated that they had gastro-intestinal disorders, renal failure and neuro-toxicity, 5.8% of them had irritation of

lungs and gastro intestinal track, kidney damage, abnormalities of the skeletal system and cancer of the lungs and prostate caused by cadmium and only 3.0% of them had impairment of neurological duet, suppression of the hematological system and kidney failure. All these health problems were caused by the presence of heavy metals in the air. These metals include lead, mercury and cadmium. Lead is either produced by industrial, vehicle emissions, paints and burning of plastics and papers while mercury is produced by electronics, plastic waste, pesticides, pharmaceutical and dental waste and Cadmium is produced from burning of electronics, plastics, batteries and contaminated water. When consumed in higher quantities they would lead to the above-mentioned health related problems.

4.4. To find out the Perception and Attitudes of the Residents of Dandora towards waste Management Problems

The NCC generally collects about 40% of the waste through it merger resources and through contracted private companies. Sixty-one private companies registered by the city council and numerous other unregistered ones of various sizes and capacities collect further 20 percent of the waste. The private companies that operate independently charge a fee to clients and typically do not serve residents who are either unwilling or unable to pay for the service. The remaining 40% of the waste is generally either left uncollected, is disposed of through other means, including by burning, dumping in pits and other unauthorized places or is collected by the numerous Non-governmental organizations, community based groups and other ad hoc or voluntary groups. It is in this connection that the researcher wanted to establish the perception and attitudes of the residents of Dandora on Waste Management problem. The results are as shown the table below.

Table 11: Distribution of Respondents by Whether Pollution is a Problem in Dandora

| | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree | No Response | Total |
|--|----------------|-----------|-----------|-----------|-------------------|-------------|----------|
| Pollution is a big problem in Dandora | 45(66.2%) | 9(13.2%) | 3(4.4%) | 4(5.9%) | 5(7.4%) | 2(2.9%) | 68(100%) |
| Industries are major polluters | 17(25.0%) | 19(27.9%) | 10(14.7%) | 12(17.6%) | 6(8.8%) | 4(5.9%) | 68(100%) |
| Domestic fuel consumption and garbage waster are another source of pollution | 26(38.2%) | 28(41.2%) | 6(8.8%) | 3(4.4%) | 2(2.9%) | 3(4.4%) | 68(100%) |
| Dandora is polluted because the government does nothing | 25(36.8%) | 12(17.6%) | 8(11.8%) | 7(10.3%) | 12(17.6%) | 4(5.9%) | 68(100%) |
| If Dandora is not checked it easily be a disaster | 35(51.5%) | 9(13.2%) | 10(14.7%) | 4(5.9%) | 5(7.4%) | 5(7.4%) | 68(100%) |
| Pollution problem is still increasing | 44(64.7%) | 8(11.8%) | 0 | 6(8.8%) | 5(7.4%) | 5(7.4%) | 68(100%) |
| Pollution has caused some disease to residents | 42(61.8%) | 11(16.2%) | 2(2.9%) | 4(5.9%) | 4(5.9%) | 5(7.4%) | 68(100%) |
| Community participation can help prevent pollution | 27(39.7%) | 21(30.9%) | 6(8.8%) | 4(5.9%) | 6(8.8%) | 4(5.9%) | 68(100%) |

Source: Field Data

Majority (79.4%) of the respondents perceived pollution in Dandora as a big problem. That pollution got from domestic fuel consumption and garbage waste are another source of pollution 79.0% of the respondents indicated that pollution has caused some diseases to the residents and 76.5% of the respondents also indicated that pollution as a problem is still

increasing. 70.6% of the respondents indicated that the community participation can help prevent pollution and 64.7% of the respondents indicated that if pollution in Dandora is not checked it easily will be a disaster. 56.4% of the respondents indicated that Dandora is polluted because the government does nothing and only 52.9% of the respondents who felt that industries were the major polluters. With this we can conclude that pollution is indeed a serious problem to the residents of Dandora. The government through the Nairobi City Council needs to find alternative ways of dealing with the waste. Among the options is to privatize the garbage collection and treatment at Dandora through incineration which though expensive ensures that the pollution levels are controlled and can use the garbage to generate income like in power supply as in the case of Britain. As the population continuous to increase in Nairobi, pollution in Dandora will get worse and therefore solid waste management should be given more attention by the Nairobi City Council and as a result residents in Dandora especially the children will live in a safe environment free of pollution and resultant diseases. The residents must be given the power to hold accountable the leaders they have chosen to ensure the pollution in Dandora is made a thing of the past and not a political campaign tool.

4.5. To Identify and Appraise community Mechanisms for solid waste management with the aim of suggesting more guidelines

There is need to promote community organizations (CBOs) that aim to give voice to the people and follow up aggressive civic organization and education. Currently Nairobi has about 236 registered residents associations Chitere and Ombati, (2004) and numerous that are not registered. They are found under two umbrella associations, the Kenya Alliance of Resident Associations (KARA) which is a national coordination body and the We Care About Nairobi (We Can Do It) that mobilizes and coordinates Nairobi Residents. There are

also several NGOs who also carry out the duty of garbage collection, it is in this connection that the researcher needs to identify and appraise community mechanisms for solid waste management with the aim suggesting more guidelines.

Evaluation of the Importance of Community participation in Pollution Management and Prevention in Dandora

| | Frequency | Percent |
|----------------------|------------------|----------------|
| Very Important | 38 | 55.9 |
| Important | 7 | 10.3 |
| Neutral | 6 | 8.8 |
| Slightly Important | 4 | 5.9 |
| Not important at all | 10 | 14.7 |
| No Response | 3 | 4.4 |
| Total | 68 | 100.0 |

Source: Field Data

Most (66.2%) of the respondents indicated that it was very important for the community to participate in pollution management and prevention in Dandora while 8.8% of them were neutral and 5.9% of them who felt that it was slightly important and 14.7% indicated that it was not important at all. This shows that if the community is actively involved in managing the pollution problem in Dandora then this problem can be stopped easily. In Thika demonstrates in the 1990's led to the government taking action against the Industries responsible for large scale pollution (Fr. Ndikaru wa Teresia (2004). One of the pressure groups formed in 2004 and affiliated to churches around Dandora and Korogocho known as Dandora inter religious committee in conjunction with human rights institutions petitioned

the Government and Nairobi City Council to relocate the dumpsite citing serious legal, economic and human rights issues.

4.6. Community Coping Mechanisms

The researcher sort also to know some of the mechanism that the community has put in place to prevent pollution. According to the respondents they were pleased with the government ban on the use of polythene bags, they have also joined hands to form CBOs that help in cleaning of their environment, they also indicated that they had benefited from some NGOs who have being practicing recycling in the area. These NGOs have offered them employment hence reduction of poverty. The residents have also joined in demonstration to lobby for the removal of the dumpsite from Dandora to another area, some residents also indicated that they had participated in planting of trees within the dumping site although most of the trees did not grow since there was no one to take care of them. These are some of the ways that the residents have participated in order to improve their livelihood and for the pollution to be managed.

The residents also indicated they would wish to be educated more on environmental education that would help them in choosing of their leaders especially the councillor who is directly attached to the Nairobi City Council and also is a resident of the area, that they were lobbying for the removal of the dumpsite and wished there could be an organization that would solicit for environmental development funds. This would come in handy to improve the situation in Dandora. The residents also indicated that they should be made aware of the health hazards that are brought about by the dump site in order to make informed decisions and advocate more aggressively for its removal.

4.7. Summary of the Findings

The residents of Dandora are aware of pollution problem in their area. They are able to rate the social impact the dumpsite has brought about in the area which include; high crime rate (22.1%), high school drop out (22.1%), market is not stimulated (14.7%) and (14.7%) increased poverty. The high school drop out may be as a result of quick money from sales of plastics and metals, access to food disposed at the dump site from large hotels, peer influence from their elder siblings and friends to drop out of school and work at the site, poverty in this region is too high hence some families are forced to just associate themselves with the dump site to earn their living and HIV/Aids scourge have also pushed a lot of children to work and survive in Nairobi. The benefits to the residents are short term compared to the large and complex social and economic effects that the dumpsite has on the residents of Dandora. Some benefits such as composting and recycling of plastics and metals that are sold to dealers can be seen as short term. In the long term the impact of pollution to the environment has caused the residents to suffer from such diseases as respiratory tract irritation affecting 72.1% of the respondents and other serious ailments that has seen the life expectancy of residents reduced.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter presents summary, conclusion and recommendations of the study.

5.2. Summary

The residents of Dandora have suffered and continued to suffer tremendously as a result of the pollution emanating from the dumpsite. The majority 72.1% of the residents interviewed said they suffered from respiratory tract infections, with another 44.2% saying it contributed to social vices like high rate of crime and high school drop out. This therefore means that the dumpsite has impacted negatively the residents and also has some positive impact. Even if they made some money from the dumpsite, they ended using the money to treat themselves and families thus remaining poor. The cost of living has also remained high since even local produce is expensive due to pollution and stigma attached. The high school drop out may be as a result of quick money from sales of plastics and metals, access to food disposed at the dump site from large hotels, peer influence from their elder siblings and friends to drop out of school and work at the site, poverty in this region is too high hence some families are forced to just associate themselves with the dump site to earn their living and HIV/Aids scourge have also pushed a lot of children to work and survive in Nairobi.

It was also noted that the level of awareness is also very high among the residents with 89.7% of residents saying they are aware of the pollution problem. 79.4 % of the residents said pollution was a big problem in Dandora with the blame resting squarely on the government and the Nairobi city council.

76.5% of the residents said the pollution problem is still increasing this is seen as a result of increase in population and improvement of the economy therefore more consumerism.

The community identified some community coping mechanisms like the presence of CBO's that helped in cleaning the environment and benefits derived from recycling some of the wastes like plastics and metals and composting which they sell to farmers.

The NGO's that operate there have also offered some residents employment hence reducing poverty. They have also lobbied for the removal of the dumpsite but the government seems unable to relocate it due to political reasons.

Some suggestions they came up with were like more environmental education or sensitization that will help them to influence change through choosing of leaders who will champion their rights and grievances. Through education they will also be more aware of the health hazards that emanate from the dumpsite and be able to make informed decisions.

5.3. Conclusion

From the findings we can conclude that social impacts are serious since many school going children have dropped out of school to go and work in the dumpsite to earn a living. Children should be encouraged to go back to school in order to be able to reduce illiteracy among the residents of Dandora. Crime rate is high and this has affected people living in Dandora. There should be a better way of handling crime in the area so as to discourage those children who drop out of school joining with criminals because of being with them within the dump site. To stop the high school drop out the children should be facilitated to

return to school and access vocational and skills training. They should be taken to homes where they can be able access to food, they should also be educated on peer influence. Equipped with the vocational and skills training they should be encouraged to earn their living hence reduction of poverty in the region. HIV/Aids awareness should be enhanced in the region and assist the orphaned children to continue with the schooling instead of dropping out of school.

5.4. Recommendations

The various actors involved in waste management including NCC, Ministry of local government, Ministry of Environment and Natural Resources, National Environment Management Authority, NGO's and CBO's need to come up with a broad policy document similar to the White Paper on Integration Pollution and Waste Management in South Africa that will aim at eradicating pollution and ensuring that citizens of Dandora don't suffer unnecessarily due to the fumes emanating from the dumpsite.

Investment in incineration should be explored in the treatment of solid waste as compared to the current method of open pit dumping and combustion, which has exacerbated the pollution problem. The cost of putting up an incinerator is huge and therefore privatization would be a viable option.

The recycling of some wastes like plastics and metals and composting should be encouraged from the source of the wastes. A change of attitudes on the consumers to segregate the wastes from the household level will reduce the levels of pollution.

Renewed advocacy activities by residents of Dandora, CBOs, NGOs and other pressure groups to highlight the impact of the dumpsite to the residents of Dandora. That what is happening is a violation of human rights to a safe and conducive environment to live in.

Stakeholders in Nairobi's solid waste management sector, for example, have demonstrated the robustness of the criteria. According to them, economic instruments appropriate for the sector are those that are politically acceptable and ensure support to the people living around the dump site. Promote poverty reduction, employment and economic growth. This will improve the efficiency of resource use and economize on scarce resources. They should take into account the available technical and human capacity for their administration and monitoring, for affordable, considering low and declining per capita income in the country. They are environmentally effective in improving human health and environmental quality, and engender equitable.

5.5. Further Recommendations

Removal of the dumpsite from Dandora to a non-residential area. Although the option to relocate it to Ruai area has been met with stiff resistance from some quarters including residents of Ruai and also aviation authorities fearing their planes would be compromised by the existence of the marabou stock birds that feed from the dumpsite and are likely to be sucked into the plane engines causing accidents.

The use of the waste to generate energy that can be used in many households has been practiced in developed countries like Britain, we can borrow a leaf and ensure we turn this waste into a viable energy resource for the country to supplement the existing energy supplies.

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APPENDICES

APPENDIX 1: LETTER OF INTRODUCTION FROM THE UNIVERSITY



UNIVERSITY OF NAIROBI
FACULTY OF ARTS
DEPARTMENT OF SOCIOLOGY

Ph (02) 334244 ext. 28167
Fax 254 2 336885
Telex 22095 Varsity Ke Nairobi, Kenya.

P.O. BOX 30197
Nairobi KENYA

November 22 2007

TO WHOM IT MAY CONCERN

RE: Mwalagho John

This is to confirm that the above named is a bona fide M.A. student in the Department of Sociology, University of Nairobi.

Mr. Mwalagho has completed the first part of his M.A. course viz coursework and has already embarked on the second part of the programme – project paper writing. He is now collecting data for his research topic entitled: **“Human Adjustment to Solid Waste Pollution: A Case Study of Dandora.”**

Kindly give him the assistance he may need from your office.


Dr. Paul N. Mbatia
Chair, Department of Sociology

c.c. **Prof. Odegi**

APPENDIX II: QUESTIONNAIRE TO THE RESIDENTS

I am a student at the University of Nairobi carrying out a research on human adjustment to solid waste pollution: a case study of Dandora area in Nairobi. Any information given will be confidential and for the purpose of this study only.

PART ONE-DEMOGRAPHICS

1. Gender

Male Female

2. Age

15-20 years 21-26years 27-32years
 33-38years 39-44 years 45-49years

3. Highest level of education attained

No formal schooling Primary Secondary
 College University

4. Marital status

Single Single Parent Married
Separated Divorced Widowed

5. Household Status

Household head Household member

6. Occupational status

Public employed Private member
 Self employed Unemployed
 Others specify

7. How much do you earn per month?

Below 5000

5000-10,000

10,000-15,000

15,000 and above

IMPACT

8. What impact has solid waste pollution had on you? (On health, social, economic)

Health.....

Social.....

Economic.....

Environment

9. Explain how you have been able to cope with the impact.

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

10. a) Are there any organizations that address issues of solid waste pollution in your area? Yes [] No []

b) If yes, which ones?

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

11. How can the impact of solid waste pollution be reduced in Dandora?

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

PERCEPTION AND ATTITUDES

12. Indicate according to pollution problems in Dandora

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|--|-------------------|-------|---------|----------|----------------------|
| 1. Pollution is a big problem in Dandora | | | | | |
| 2. Industries are the major polluters | | | | | |
| 3. Pollution is also got from domestic fuel consumption and garbage waste are another source | | | | | |
| 4. Dandora is polluted because the government does nothing | | | | | |
| 5. If pollution in Dandora is not checked it could easily be a disaster | | | | | |
| 6. Pollution problem is still increasing | | | | | |
| 7. Pollution has caused some disease to residents | | | | | |
| 8. Community participation can help prevent pollution | | | | | |

Community Coping Mechanisms

13. Are you a member of any community based organization dealing with environmental activities? Yes [] No []

14. Please rate how you evaluate the importance of community participation in pollution management and prevention in Dandora?

Very Important [] Important [] Neutral []

Slightly Important [] Not important at all []

15. In what areas do you think that the community has done so far to prevent pollution?

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

16. Which of the following mechanisms are the most important in pollution prevention in Dandora? Rate them in order of importance (1, 2, 3, 4, 5)

- [] Environmental Education
- [] Lobbying of removal of the dumpsite
- [] Soliciting for environmental development funds
- [] Choice of Leaders who are Environmental Conscious
- [] Being informed of the Health Hazards brought about by the Dump site

Thank you in advance

APPENDIX III: QUESTIONNAIRE TO THE DOCTOR

1. What impact has solid waste pollution had on your patients?

Health.....

.....

Social.....

Economic.....

.....

2. Which ailments do you treat regularly in your health centre

Air borne () Water borne ()

3. Explain how you have been able to cope with the impact.

.....

.....

.....

.....

.....

4. a) Are there any organizations that address issues of solid waste pollution in your

area? Yes [] No []

b) If yes, which ones?

.....

.....

.....

5. How can the impact of solid waste pollution be reduced in Dandora?

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

Community Coping Mechanisms

6. Are you a member of any community-based organization dealing with environmental activities? Yes No

7. Please rate how you evaluate the importance of community participation in pollution management and prevention in Dandora?

Very Important Important Neutral
Slightly Important Not important at all

8. In what areas do you think that the community has done so far to prevent pollution?

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

9. Which of the following mechanisms are the most important in pollution prevention in Dandora? Rate them in order of importance (1, 2, 3, 4, 5)

- Environmental Education
- Lobbying of removal of the dumpsite
- Soliciting for environmental development funds
- Choice of Leaders who are Environmental Conscious
- Being informed of the Health Hazards brought about by the Dump site

Thank you in advance