INDUSTRIAL DISCHARGE IN NAIROBI: AN ANALYSIS OF REGULATORY ENVIRONMENT, QUALITY OF DISCHARGE AND MEDIA COVERAGE

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DECLARATION

This thesis is my original work and has not been presented for the award of a degree in any other University or any other award.

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DEDICATION

I dedicate this thesis to my late parents, Eliakim Namwaya and Jennifer Apondi, and my late sister, Irene Awino, all of who were called to eternity at the time I was working on the thesis. Even though their departure was naturally disruptive, they remained a remarkable source of inspiration and strength to an otherwise incorrigible non-believer in the afterlife.

ACKNOWLEDGEMENT

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LIST OF ACRONYMS AND ABBREVIATIONS

AAEE	American Academy of Environmental Engineers
AFP	Agence France – Presse, a French international news agency
AP	Associated Press, an American international news agency
API	American Petroleum Institute
BBC	British Broadcasting Corporation
BOD	Biochemical Oxygen Demand
CAI	Consumer Awareness Information
CCN	City Council of Nairobi
CNN	Cable News Network, an American international TV station
COD	Chemical Oxygen Demand
EMCA	Environmental Management and Coordination Act
GOK	Government of Kenya
IT	Information Technology
KBS	Kenya Bureau of Standards
KCC	Kenya Cooperative Creameries
NEMA	National Environment Management Authority
NMG	Nation Media Group
NTV	Nation Television
FM	Frequency Modulation
NWSC	National Water and Sewerage Company
SPSS	Statistical Package for Social Sciences
TV	Television
WHO	World Health Organization

UNEP	United Nations Environmental Programme
UN	United Nations Organization
USA/US	United States of America
WSRB	Water Services Regulatory Board

ABSTRACT

Management of wastes – industrial or otherwise – is a primary step in safeguarding human health. The media, with its agenda-setting role, is important in as far as highlighting the health hazards of poor management of waste is concerned. This study, therefore, focuses on the media and the management of industrial discharge in Nairobi. The objectives of the study were: to determine the volumes of effluent waste emissions by industries; evaluation of industrial effluent discharge and determining frequency of mass-media coverage of these issues. The study particularly looked at how the mass media covered the issue of industrial discharge and its management or failure thereof in Nairobi, whose population at the time of study was 3.7 million people. Nairobi also has the highest number of industries, which in effect means that Nairobi also has the highest amounts of effluent discharge than any other Kenyan town. From the study both qualitative and quantitative data was obtained through observation, newspaper content analysis, interviews with key informants, the administration of questionnaires and laboratory tests. Data processing was by Statistical package for Social Sciences to generate frequency tables, graphs and charts. Raw industry data was also subjected to anova. The results showed that different metals were present from generated industrial waste. From the findings, the amount of metal levels (mg/1) in the discharge include Iron, Cadmium, Copper, Mercury, Arsenic and Lead. In total, industries in Nairobi discharge on average 201,600 cubic meters of effluents per month. Majority of respondents, which was at 75%, felt the media has not paid attention to the issue of industrial discharge at all and further found that relevant authorities have not enforced laws as required. The study recommended strict enforcement of environmental laws and strengthening of regulatory institutions to ensure that the type of waste effluent generated is adequately analyzed to facilitate treatment before discharge. Additionally, environmental journalism to undertake proper researched cases that capture environmental protection including effluent discharge and industrial emissions.

CHAPTER ONE: INTRODUCTION

1.1   Background of the Study

1.1.1   Overview

The concept of the environment and the media has developed significantly over the years, and researchers have found that the media has improved greatly in its coverage of environmental issues over the past 50 years. Despite this notable improvement, however, environmental researchers have expressed concern regarding the quality of that coverage and the near media neglect of certain key aspects of environmental science (Fahn, 2008). The management of wastewater in general and, in particular, the management of industrial discharge, the focus of this study, are some of the environmental issues that the media has yet to prove capable of rigorously analyzing or even reporting in a manner that makes sense to the public and policy makers (Takahashi, 2011). This observation is probably more applicable in developing countries than it is in developed nations. In developing countries, for example, the focus of the media and specialized environmental journalists appears to be more about forests, wildlife and agriculture (Otinga, 2014) and less about industrial discharge.

1.1.2   Analysis of Waste Generation, Population and Environment

There has been notable growth in human population and significant advances in technological development in the world, consequently resulting in corresponding rise in material consumption (Obudho and Aduwo, 1989). It follows therefore that as societies consume more resources and manufacture more products, more waste is generated. For purposes of this study, the term waste has been used to refer to any unwanted item or substance that result from human activity or industrial processes (Brennan and Winhgott, 2005).

Kenya's population, for example, has been growing steadily since the 1960s. The most recent censors' places Kenya's population at 40 million people compared to 30 million people ten years earlier (GoK, 1999). Industries have also correspondingly risen in number. This is key in understanding the rising problem of increase in the volumes of waste and thus an attendant problem of waste management (Syagga, 1993). By 2006,

for instance, there were about 2,527 industries in Kenya, out of which 1,206 or 47.8 percent, which is clearly close to half the country's industrial establishment, were located in Nairobi (McCombs, 2002).

At the global stage, industries in the developed countries generate up to 90 per cent of the world's industrial wastes, particularly those that are hazardous (Obudho and Aduwo, 1989). It has been estimated that in 1984 alone, some 325 million to 375 million tons of toxic industrial waste were generated worldwide, around 5 million tons of which were in the newly industrialized and developing countries like Kenya (Sheppard *et al.,* 2010). Viewed in the context of this study, therefore, and depending on how the industrial wastes are managed and thus disposed, they could have wide ramifications on the environment generally and the natural resources of immediate and significance to humanity, such as water. The extent to which the media understands these facts and the resulting dynamics has been found (Barker, 2006) to be critical not just in the way it handles such news items but also in the way the authorities respond to public concerns.

What is notable about the challenges of wastewater management is that this reality has been of great international concern mainly because, first, of the obvious hazardous or health effects (Lamba, 1994) of the industrial wastes. Secondly, it has been a course for international concern because of the high cost of the very exercise of cleaning up the wastes, in many cases beyond the financial and technical capacities of developing countries such as Kenya (Ensink *et al.,* 2004). Technologies for managing industrial waste have advanced over the years, which has meant that the cost of managing industrial waste has significantly been minimized from what was the case half a century ago.

Waste management in developing countries like Kenya suffer from a variety of challenges, scarcity of financial resources being just one of them (Hernandez *et al.,* 2010). The most pronounced problem in developing countries is the underdeveloped jurisprudence in the areas of environment and waste management in these individual countries, coupled with low public consciousness on matters of environmental safety and cleanliness, and this has meant moderate attention paid to issues of waste management both by the mass media and the authorities.

In has also been noted in some scholarly materials (Syagga, 1993) that land-filling generally occurs close to industrial sites that are surrounded by poor neighborhoods or shanty towns, a very common phenomenon in developing countries, with Nairobi exhibiting a peculiar pattern of the emergence of informal settlements around industrial centers and upmarket estates. These dangers, however, have been suggested to point at the need for land use planning in developing countries, and the more urgent need to implement and enforce such plans, as the starting point for proper industrial waste management (Majale, 2002).

This research sets out to study the challenges associated with the management of industrial effluent in Nairobi, primarily because, while there have been several studies on the aspect of solid and hazardous waste management, comparatively little attention has been paid to effluent waste in the country (Mung'ou, 2007). This study further looks at the issue deficiency of information, the coverage of these issues by the mainstream print media. The phrase mainstream print media in this study has been used in reference to Kenya's two leading daily newspapers, The Standard and The Daily Nation. The two have been chosen because of their wide reach, readership and consistency and thus presumed impact (ibid).

1.2   Problem Statement

Nairobi leads in the number of industrial parks in Kenya that are differentiated either on processing, manufacturing and assembling. These characterized processes in these industrial parks result into environmental degradation from their effluents and emission (Obudho and Adowo, 1989). As development is expected to reach its peak by 2030, the mushrooming of industries in Nairobi will be high. This will pose more threat to urban ecosystem especially on riparian lands that are being encroached for industrial purposes.

The major urban water bodies like rivers will be compromised with amplified pollution from effluent and emissions that find their way to rivers. A study by Peters 1998, attests that Nairobi is among the Cities in Sub-saharan Africa that industries have haphazardly expanded, encroaching designated residential areas and causing threat to riparian water marks. This exposes residents to harmful environment that is degraded and polluted. This study aims to assess role of mass media towards advocating for this accruing environmental catastrophe in Nairobi. Not much has been done through environmental

journalism towards environmental conservation and highlighting plights of the residents on industrial pollution (Oting'a, 2014).

1.3 Justification

The significance of proper management of waste, and with particular reference to the management of effluent waste, cannot be overstated. It has been argued that generation of waste can degrade water quality and can therefore affect human health while causing ecological damage. It is noted that accumulation of waste is a symptom of deficiencies in its management, and indeed the negative effects on the aesthetic qualities of the environment are enormous. This underscores the significance of proper management of effluents and sensitization of the public (Corcoran, 2010)

It is widely acknowledged that mass media has a critical role in environmental matters, especially the protection and conservation of the environment. It has been argued that for the mass media to play a useful role, the writers must have an understanding of scientific language and practice, knowledge of historical environmental events, the ability to keep abreast with environmental policy decisions and the work of environmental organizations, a general understanding of current environmental concerns, and the ability to communicate all of that information to the public in an understandable manner (Stevenson, 2007).The role of the media on environmental issues can be traced to and follows the tradition of prominent nature writers. The role of the media on environmental concerns in general and effluent waste in particular have since the 1960s and 1970s assumed a significant place and it has been apparent that the mass media has, wherever it plays its rightful role, generated public interest on environmental issues over time (Hesselink *et al.,* 2007)

With new technologies shaping the nature of communication globally, and with increasing concern over pollution and environmental degradation, it seems likely that the mass media will lend itself as a more important tool for environmental advocacy. The casual approach in the past to effluent waste management/disposal, coupled with the sporadic coverage by the Kenyan press, makes an assessment of the role of the mainstream print media's coverage and its eventual effect on the management of waste effluent significant. There is a knowledge gap on the linkage between the mass media's role and public awareness on effluent waste management and the development of

policies and laws and their enforcement. This study seeks to generate part of the information that will help address the dearth of knowledge in this area.

1.4   Objectives

This research had five primary objectives:

a) To determine the extent of industrial effluent emissions by industries in Nairobi.
b) To evaluate quality of industrial effluent discharge in Nairobi and how industries manage or treat the effluents.
c) To assess the knowledge, attitude and perceptions of key stakeholders in relation to industrial effluent.
d) To determine the frequency of mass media coverage of issues relating to effluent waste management in Nairobi.
e) To evaluate the relationship between national policy reviews and law enforcement changes with media coverage.

1.5   Research Questions

a) What is the extent of industrial effluent discharge in Nairobi?
b) What is the quality of effluents discharged by industries in Nairobi and how does this compare with the compliance standards set by regulatory bodies?
c) What is the level of understanding, attitude and perception of those living in neighborhoods near industries?
d) What is the frequency of coverage by Kenya's mainstream print media of issues relating effluent waste management in Nairobi?
e) What is the linkage between national policy reviews and law enforcement changes with media coverage?

1.6   Hypotheses

H_1 The Mass media is reluctant to cover industrial effluent pollution in Nairobi.
H_2 Metal pollutants are present in industrial effluents in Nairobi.

1.7   Limitations of the Study

In the course of the research, a number of limitations initially unanticipated came to the fore. First, while Nairobi is the hub of industries with the highest urban population of four million and thus experiences high generation of waste effluent from industries, the

compliance rate by industries is very low. Further, even though Nairobi is the headquarters of numerous environmental bodies, including the National Environment Management Authority (NEMA) as well as the United Nations Environment Programme (UNEP), there is no single body that appears to have a centralized database for effluent waste in the capital, let alone initiatives aimed at enforcing the way the waste is disposed (Culbertson et al, 2012)

This, consequently, engenders an additional limitation: without key data on effluent waste generation and thus management, there are no organized approaches to media and communication of environmental information. The other challenge was that none of the environmental authorities in the country, including the ministry of environment, have a tangible media and communications policy, along with a monitoring mechanism for media, that can be analyzed. But the limitation with the highest implications for the study was that a section of respondents, the managers of industries suspected to be discharging effluent into the neighborhoods, declined to be interviewed. The other notable limitation is that the research area was only the Capital City, Nairobi. It therefore means that, although its findings may be extrapolated as a general indicator of what is happening in other parts of the country, they are not representative enough for a clear understanding of the situation in the country.

1.8   The Conceptual Framework

1.8.1   Agenda Setting Theory of the Media

Scholars the world over have noted the media's ability to influence the salience of topics on the public agenda. MacCombs (2006) is among those who have observed that if a news item is covered frequently and prominently, the audience will regard the issue as more important. This study therefore builds the argument that the public relies heavily on the media for information about the environment, and builds on the previous studies that have established a strong correlation between the media and public agenda. But it has been shown that the media's environmental agenda is highly dependent on the agenda-building efforts of experts in the sector, who provide information to the media to ultimately influence public perception and government policy priorities (Boykoff, 2009). This study argues that Kenyan environmental experts, especially those working on effluent waste, have failed to provide information to the media as frequently as would be necessary to set the public perception of the subject as an important one.

The study further argues that the failure of environmental experts to communicate effectively to the media is partly the reason policies and laws have been poorly implemented

1.8.2 Process of Environmental Communication

Researchers have long concluded that mass communication is a dynamic process that involves the transfer of meaning, transmission of social values, and sharing of experiences between a communicator and other people. On the other hand, environmental mass communication is a process involving a common content that deals with environmental issues. Environmental communication generally goes through a two-way flow of information. On the one hand, communicators send the message to the public and on the other receive feedback from the audience (Culberton *et al.,* 2012). The result is public awareness of environmental challenges, increased public understanding of issues and, possibly, a commitment to guard public interest (Liang, 2011).

Environmental communication is a study about science because the two are sometimes interrelated. Generally, there are two major ways of disseminating environmental information about the environment - through environmental agencies and through the mass media. Environmental agencies usually have some contact with scientists through field personnel. They communicate with the public by using their own channels, namely Information and Education (I and E) offices. I and E offices also send messages such as news releases to the mass media while reporters still keep in touch with agency personnel to get the news (Jurin *et al.,* 2010).

1.8.3 Science and Environmental Communications

Reporters take their messages through editors before releasing to the public (Otinga, 2014). In contrast, substantially all of the feedback from the public goes back to the writers and reporters rather than to the editors because journalists have more daily relations with the public as a part of their job. Hence, the flow of feedback creates a problem. That is to say, the editors, who are the main gatekeepers of the news flow, become less aware of public wants and needs, and least responsive to change. Reporters dealing with the field can be divided into environmental, outdoor and science journalists. Only the last have regular contact with scientific communities, either by

personal relationship or scientific journals, because of some common scientific backgrounds (Restall and Conrad, 2015). Though scientists also communicate with their counterparts, this kind of information hardly gets to the public. They contact each other mainly through scientific journals which certainly are unknown to ordinary people (O'Hara *et al*, 2012).

The most widely recognized concept of environmental communication is created by J. W. Parlour and S. Schatzow, the two-step flow (Hansen, 1991). The two-step flow theory hypothesized that information sent by mass media does not go to the public directly. Instead, it is passed through people who relay their interpretation of it. This group of people is called opinion leaders, who are likely to be highly educated. Contrary to the basic idea of the two-step flow of information, environmental problems are initially perceived by opinion leaders, most of whom hold influential positions either in governmental agencies or universities, instead of being directly perceived by the media (Dechant and Altman, 1994).

Independent Variable | Intervening Variable | Dependent Variable
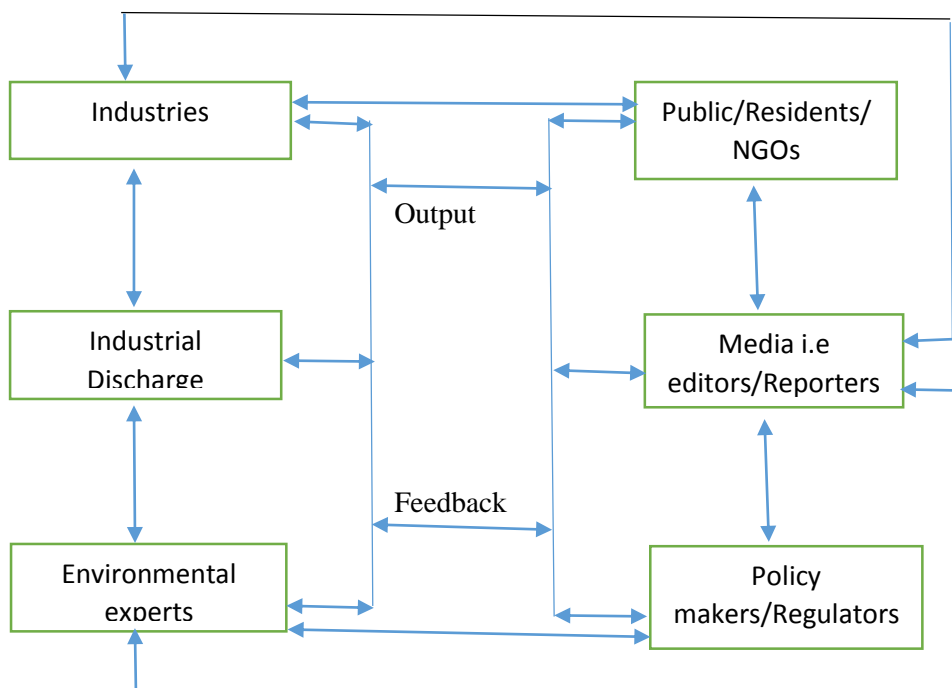
Figure 1.1: Sketch showing Conceptual Framework of the study

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1.9   Definition of terms

Acids: A chemical substance (typically, a corrosive or sour-tasting liquid) that neutralizes alkalis, dissolves some metals, and turns litmus red (Lew, 2008).

Activated Sludge: A biological method of wastewater treatment that is performed by a variable and mixed community of microorganisms in an aerobic aquatic environment. These microorganisms derive energy from carbonaceous organic matter in aerated wastewater for the production of new cells in a process known as synthesis, while simultaneously releasing energy through the conversion of this organic matter into compounds that contain lower energy, such as carbon dioxide and water, in a process called respiration (Falcioni *et al,* 2006).

Alkalis: A chemical compound that neutralizes or effervesces with acids and turns litmus blue; typically, a caustic or corrosive substance of this kind such as lime or soda (Gallagher and Ingram, 2001).

Biodegradable organics: Capable of being decomposed by biological agents, especially bacteria (Thakur *et al.,* 2014)

Broadcast Media: Electronic instrumentation of radio and television, including local radio and television stations, radio and television networks and cable television systems. Because of their ability to reach vast numbers of people, broadcast media play a very important role in any advertising campaign that needs to reach a broad market base.

Effluent Waste or Wastewater: Water that has been used by industries for the industrial process such as manufacturing process and so contains waste products (Garg *et al.,* 2004)

Industrial Wastewater Treatment: Industrial wastewater treatment covers the mechanisms and processes used to treat waters that have been contaminated in some way by anthropogenic industrial or commercial activities prior to its release into the environment (Chen *et al.,* 2006).

Mainstream Mass Media: Mainstream media, or mass media, is generally applied to print publications, such as newspapers and magazines that contain the highest

readership among the public, along with radio formats and television stations that contain the highest viewing and listener audience, respectively. This is in contrast to various independent publications, such as alternative weekly newspapers, specialized magazines in various organizations and corporations, and various electronic sources such as podcasts and blogs (Salman *et al.,* 2009)

Newspaper Content Analysis: a research technique for the objective, systematic, and quantitative description of manifest content of communications. Content analysis is a research tool focused on the actual content and internal features of media. It is used to determine the presence of certain words, concepts, themes, phrases, characters, or sentences within texts or sets of texts and to quantify this presence in an objective manner

Parallel Plate Separators: a device designed to separate gross amounts of oil and suspended solids from the wastewater effluent oil refineries, petrochemical plants, chemical plants, natural gas processing plants and other industrial sources.

Sedimentation: The act or process of depositing sediment or the process by which large molecules or macroscopic particles are concentrated in a centrifugal field in a centrifuge or ultracentrifuge (Poon and Chu, 1999)

Trickling Filter Process: a bed of broken rock or other coarse aggregate onto which sewage or industrial waste is sprayed intermittently and allowed to trickle through, leaving organic matter on the surface of the rocks, where it is oxidized and removed by biological growths (Daigger *et al.,* 1993).

Waste Disposal: Waste management is the collection, transport, processing, recycling or disposal, and monitoring of waste materials. The term usually relates to materials produced by human activity, and is generally undertaken to reduce their effect on health, the environment or aesthetics.

Waste Management: Waste management is the collection, transport, processing, recycling or disposal, and monitoring of waste materials. The term usually relates to materials produced by human activity, and is generally undertaken to reduce their effect on health, the environment or aesthetics (Syagga, 1993).

CHAPTER TWO: LITERATURE REVIEW

2.1   Introduction

In this section, the study reviews the available publications and previous findings that either relate to or have a bearing on the subject of the study. In the first section, the situational analysis, the study delves into the general question of wastewater management around the world, with some specific references to Kenya. This is relevant because, for it to be considered either efficient or satisfactory, waste management in Kenya has to be compared to the international best practice.

In the subsequent section, the study shifts to the management of industrial waste, which is the main basis of the research, and looks generally at what would be the general composition of industrial waste as well as some of the industrial wastewater treatment technologies around the world. This is crucial, for it is only with adequate knowledge of the general composition of effluent waste that a relevant decision on technology and other waste management designs can be made, and it is then that the coverage and contribution of the media to its management can be assessed.

The study also looks at the literature on effluent waste management, as well as literature on the contribution of media coverage towards effluent waste management around the world. In the end, the study takes note of some of the research on wastewater management in Kenya as well as limited literature on the role of the media. This, clearly, is an unexplored area in terms of academic discourses and publications and, due to the restricted nature of this study, this work should serve only as the beginning of an inquiry in this field, to enrich the available literature.

2.2   Situation Analysis

The concept of proper wastewater management is founded on the premise that water is crucial for all aspects of life and thus defines the features of the planet earth . It has been established that up to 97.5 per cent of water is in the oceans, and out of the remaining freshwater only one per cent is available for extraction and use, which actually underscores the significance of its proper management. But even as the world enters into the 21st century, it faces a water crisis, both in quantity and quality, caused by continuous population growth, industrialization, agricultural practices, increased living standards and poor water utilization (Corcoran *et al.,* 2010).

It is indeed true that wastewater management, or the lack of it as the case may be, has a definite direct impact on the biological diversity of aquatic ecosystems, thus disrupting the basics of life support systems on which a wide range of sectors from urban development to industry depend (Rammont and Amin,2010). It is essential that wastewater management be considered part of integrated, ecosystem-based management that operates across sectors and borders and thus the contribution of the media is better assessed when this is taken into account.

2.3   The Global Trends

It is a fact that most industrial processes such as heating, cooling, production and cleaning consume tons of water. Globally, an estimated 5-20 per cent of total water usage goes to industries, which generate a substantial proportion of total wastewater. Therefore, if unregulated, and as noted elsewhere in this study, industrial wastewater has the potential to become a highly toxic source of pollution (Corcoran *et al.,* 2010).

Complex organic compounds and heavy metals used in modern industrial processes, if released into the environment, can cause both human health concerns and environmental disasters. That is why most researchers, and indeed most countries such as Kenya, agree that industries have a corporate responsibility to ensure discharged water is of acceptable standard. One of the most contentious propositions but which is being widely accepted is that industries should take up the costs of cleaning, which is in line with the polluter pays principle. Most countries have focused on preventing contaminants from getting into the wastewater stream or developing a closed system of water use (Qadir, 2010).

Researchers have consistently found that, in most developing countries such as Kenya, more than 70 per cent of industrial wastes are dumped untreated into waters. This is despite the fact that industrial discharges usually contain a wide range of contaminants that originate from diverse sources. Some of the biggest generators of toxic industrial waste include, and are not limited to, mining, pulp mills, tanneries, sugar refineries and pharmaceutical production. In most developing countries, wastewater from industry drains directly into rivers and lakes, as well as seeping into the ground, contaminating aquifers and wells. This pollutes water supplies, which often goes undetected, as the authorities in developing countries are either unconcerned or can barely afford the costs of monitoring.

2.4   Effluent Waste Management Practices and Technologies

In the most traditional sense, disposal systems usually remove wastewater from the source, whether industry or otherwise, separate contaminants from the wastewater, and return effluent to the soil. The wastewater would ordinarily include suspended solids, dissolved organic and inorganic materials, and microorganisms such as viruses and bacteria. An on-site effluent management system treats this waste on the property where the wastewater originated (CAI, 2008).

In very simple terms, an on-site treatment could involve the use of a septic tank (anaerobic) or an aerobic tank (with an air agitator). In both, bacteria separates and partially decomposes large solids. Bacteria also digests some of the solids and grease. The digestive (septic) processes release a smelly gas that moves back through the sewer pipes and is discharged by a vent through the roof (Wong, 2013)). The liquid out-flow from the wastewater tank (effluent) contains disease-causing bacteria and nutrients and must have further treatment through a soil absorption system. The laws of most states and counties prohibit the direct discharge of septic system effluent onto the ground surface or into surface waters.

In the US, for example, 85 percent of on-site wastewater disposal systems are septic systems. They treat wastewater by allowing anaerobic bacteria (that live in the absence of air) to digest organic materials, while allowing scum and sludge materials to separate from the wastewater. In a soil absorption system, wastes that the bacteria cannot digest are filtered and removed from the effluent (CAI, 2008).

Septic tanks may have one or several chambers where solids are separated from wastewater. The biological action of bacteria compacts the heavier solids causing them to settle at the bottom of the chamber. Lightweight compounds such as waxes and grease drift to the surface. Any indigestible solids must be periodically removed from the tank. Even after the septic tank has separated sludge and other solids, its clarified effluent is not yet purified. As an example, the effluent is likely to contain high levels of bacteria and phosphorus, which must be removed or inactivated before reaching the water table.

Aeration systems are closely related to the septic tanks. They use bacteria that live only in the presence of air. The purification process in an aeration system is generally similar

to a septic tank in its initial stages. Following treatment in the first chamber, incoming wastewater forces effluent into a second chamber, through a pipe equipped with a filter or baffle (Iqbal *et al.,* 2005). Next, fine bubbles of air are blown into the effluent, encouraging the growth of aerobic bacteria, which feed on the organic nutrients and decompose them. The partially treated effluent then flows into a settling chamber. Bacteria fall to the bottom of the chamber, where a sloping floor returns them to the first chamber to continue biodegradation although septic and aeration tanks remove many pollutants from wastewater, further treatment is required after the effluent leaves the tank. Nitrogen compounds, suspended solids, organic/inorganic materials, bacteria, and viruses still must be reduced before the effluent is considered purified through the processes of adsorption and absorption.

Adsorption refers to the process by which pollutants are attracted to and held on the surfaces of soil molecules, thus immobilizing them. Absorption is a more general term used to describe the way in which pollutants are removed from effluent as it percolates through the soil. Soil absorption systems remove most of the suspended solids by filtration and reduce the contaminants by adsorption and microbial degradation. The action of microbes consumes or transforms nutrients and makes them harmless (Chen *et al.,* 2011).

2.5 International Media and Waste Management

Communications experts have over the years lamented that the mass media is more of a scarce commodity for environmental organizations. This is because, no matter how professionalized their public relations practices are, they must still compete alongside other, better-resourced corporate interests. It has also been argued that this is especially true when genuine grassroots organisations find themselves competing alongside manufactured corporate social movements. Even Greenpeace, an American international organization well known for its positive media relations, was unable to easily push the issue of genetic engineering onto the public agenda for debate, despite years of campaigning. The British media, for example, were extremely unwilling to look behind the hype of the companies (Jensen, 2008).

Ideological biases like these mean that media organizations can pick the environmental movements that best capitulate to their corporate driven demands for newsworthiness. This encourages environmental movements to make concessions to their causes by

becoming more media savvy and by internalizing media values to maximize their media coverage. Yet, even when compromises are made to obtain favorable media coverage, the capacity, intellectual or otherwise, of environmental groups to control how their stories are framed is questionable.

Interestingly, despite the rising power of the environmental movement and increasing public awareness of environmental issues, this has not necessarily equated with improved media coverage. In fact, a comparison of environmental pollution coverage between 1972 and 2000 in the US newspapers found that the nature of the coverage was unchanging (Gamson, 2004). Thus campaigning around the issue of pollution has had almost no effect on the mass media's discourse. If anything, the media framed the issue to oppose the environmental movement's objectives

Considering that, even though 73 per cent of the articles identified industries as the main cause of pollution, it was the governments, which were singled out as the bodies responsible for dealing with the pollution. But it has been argued that this framing leaves citizens with little sense of personal urgency to combat environmental pollution, as it appears that the government is responsible for taking action. Similar framing was evident in the media coverage of environmental stories in Australia and Canada and it would be correct to argue that there is a good amount of framing by media in developing countries too.

The American study also showed that 90 per cent of the articles failed to mention the presence of local environmental organizations working to combat pollution or encourage proper waste management. Furthermore, 83 per cent omitted any mention of national environmental groups. The media's role in covering waste management issues, and this would include wastewater management, could thus be described as manufacturing consent.

Despite a flawed coverage of environmental issues, most historians of environmentalism have nonetheless taken note of the media's importance (Dunlap and York, 2008). It is widely accepted that the media plays an important role in shaping the environmental movement, both by informing people of environmental problems, such as waste disposal and by influencing the way people thought about environmental issues.

2.6   Media and Management of Industrial Effluent in Kenya

Since 2007, the Kenyan government has been at the forefront of cleaning and preventing waste discharge into Nairobi River. By 2014, up to 20 organizations led by the National Environment Management Authority and the ministry of environment were already working jointly to stop the discharge of waste effluent into the river. Pollution of Nairobi river, which is mainly as a result of discharge of waste from households and slaughterhouses, is just one such example of the effects of poor management of waste water in Nairobi, and which need to be managed adequately (Otinga, 2014).

While the ongoing cleaning of Nairobi River is commendable, the efforts would not have achieved as much this far were it not for the contribution of the media. Led by the then minister for environment, the late John Michuki, the effort to clean Nairobi River was regularly covered by both print and electronic media, thus elevating the issue to greater significance in the eyes of the public and policy makers. The fact the effort to clean Nairobi river was regular news in the mainstream media saw various stakeholders and donors such as the United Nations Environment Program join the initiative, providing the much needed support and publicity that for a moment ensured the project was a model of success (Kithii and Mutua, 2006)

But the media has not always been a strong partner in highlighting environmental concerns. At the very best, the media coverage has been sporadic and limited to occasional environmental projects spearheaded by influential individuals. The media coverage, in other words, has not been a sustained effort to spotlight some of the most worrying environmental challenges such as poor management of waste effluent and their root causes in any manner that can lead to significant policy shift. Other researchers have attributed this short media attention span to the commercial nature of the media, which drives it to be more preoccupied with political stories at the expense of environmental issues. Scholars have continued to lament that environmental concerns are only given prominence in the media and thus make front-page news when a disaster strikes or when an environmental project assumes political dimensions (Dahlén and Grenros, 2009).

Scholars have noted that, even then, the media's interpretation of environmental challenges and their root causes in Kenya, like in many other developing countries, is

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often inaccurate and analysis of issues less rigorous. This has routinely undermined the quality of coverage of environmental issues. Such coverage has in any case been overly skewed, as it is focused largely on urban areas, whose population is comparatively more environmentally aware than in the rural areas. This means that environmental concerns in some areas of the country have likely not been given the right level of attention while, at the same time, other pressing environmental issues that have not risen to the level of a disaster or attracted the attention of prominent personalities are likely being overlooked.

A quick review of the environmental or science issues that Kenyan media has focused on over the past decade reveals a leaning towards issues relating to forest degradation, controversy surrounding the safety of genetically modified foods, wildlife, climate, mining and, in some cases, environmental pollution. Further analysis shows that there is nothing substantive about how Kenyan media covers environmental issues, including waste management. In any case, the media's coverage of these issues seems pegged on statements from experts, NGOs working in those areas or from government officials. The quality of the stories shows that the media barely goes beyond statements provided by these groups and thus the media often fails to reveal a wide range of underlying environmental concerns across the country (Boykoff, 2009)).

On the face of it, the management of industrial effluent, even just in the capital Nairobi that has the highest concentration of industries, receives the least attention from media – unless when there is either controversy or communities take to demonstrations to highlight an issue. The management of industrial effluent receives limited media attention, something that can be attributed to two factors. The first is that industries in Kenya/Nairobi are generally less communicative and even less accessible to researchers interested on their compliance with national standards for managing waste effluent. The second is that government agencies tasked with monitoring and enforcing compliance with necessary standards are not transparent with their work. These factors were consistently of concern throughout the course of this study.

CHAPTER THREE: RESEARCH METHODOLGY

3.1   Introduction

This chapter presents the methodology adopted by the researcher to actualize the objectives. In the very first section, the physical features of the area of study, together with why the area was selected for the study, are discussed and contextualized. The subsequent sections present the data collection methods applied and how the data were eventually analyzed and displayed.

3.2   Study Area

The research focused mainly on industries within Nairobi, which was selected because of its high concentration of industries, which means it also has a high effluent discharge.

Figure 3.1: Map showing study areas, Source: Survey of Kenya
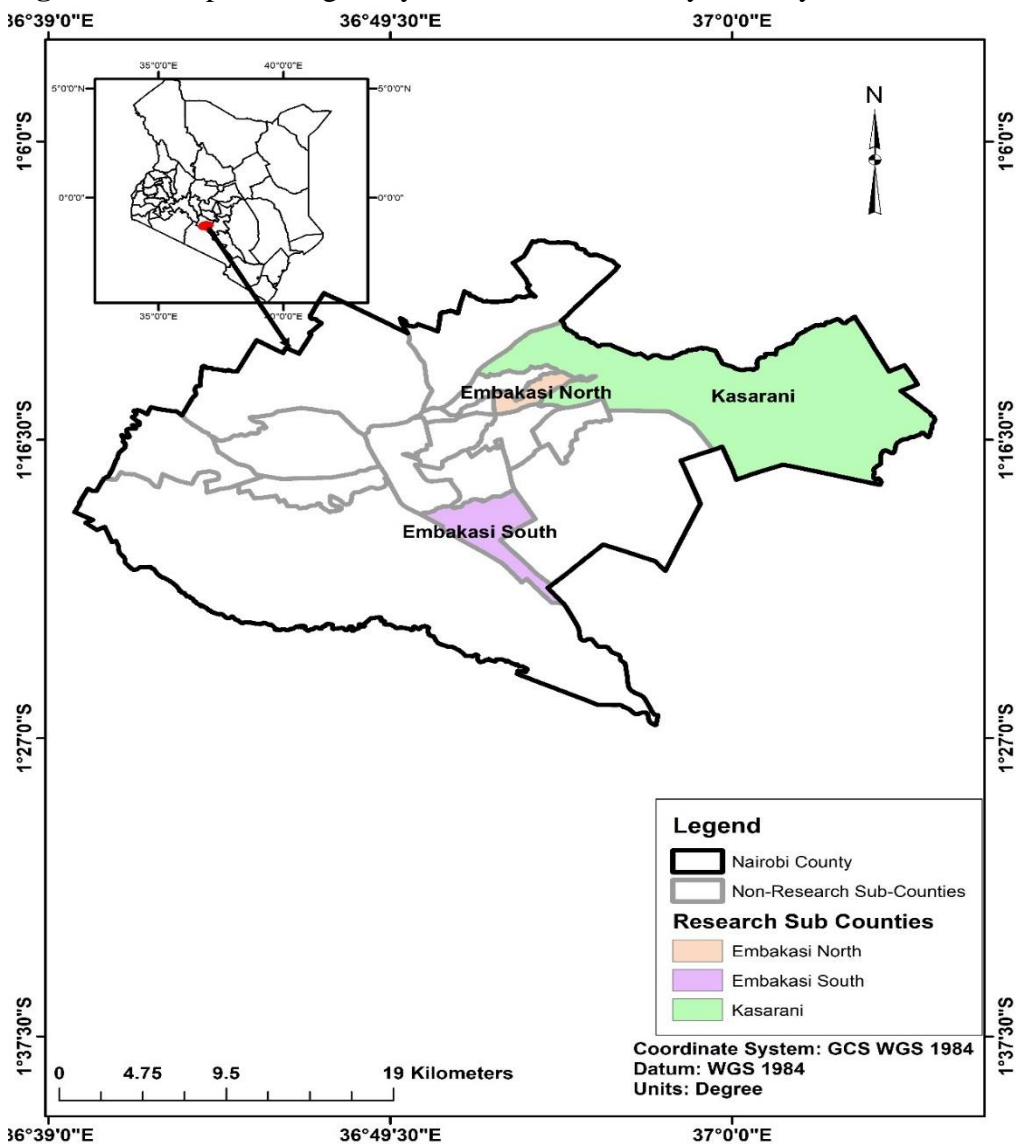
3.2.1   The Location of Nairobi

Nairobi is a city found in Nairobi Area, Kenya. It is located -1.28 latitude and 36.82 longitude and it is situated at elevation 1661 meters above sea level. Nairobi is located in south-central Kenya, 140 kilometers (87 miles) south of the equator. Nairobi is 500 kilometers west of the Indian Ocean in Kenya's Central Highlands. Nairobi lies within the latitudes of 36º40'0'' E, 37º0''E and longitudes of 1°0'0''S, 1º20'0''S Figure 3.1. It lies adjacent to the eastern edge of the rift valley and is situated 5450 feet (1661 metres) above the sea level. The Ngong Hills occupy the western part of the city. Mount Kenya is located to the North of the city and Mount Kilimanjaro lies towards south-east of Nairobi.

3.2.2   The Climate of Nairobi

Placed on a high altitude, Nairobi experiences a moderate climate with sunny dry season sand cool wet seasons. The city is pretty warm in between December and March, while in June and July the temperatures drop down leading towards chilled evenings. Rainfall is moderate. The drizzles are enjoyed in between late summer and autumn. Nairobi has a subtropical highland climate. Evenings may be cool, especially in the June/July season, when the temperature can drop to 9 °C (48 °F).

The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day. The mean maximum temperature for this period is 24 °C (75 °F). There are two rainy seasons, but rainfall can be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. As Nairobi is situated close to the equator, the differences between the seasons are minimal.

3.2.3   Nairobi's Human Population

By 2011, Nairobi was estimated to have a population of 3.36 million. This makes Nairobi the second-largest city by population in the African Great Lakes region after Dar es Salaam, Tanzania. According to the 2009 census, 3,138,295 Nairobi inhabitants lived within 696 square kilometers.

Nairobi is home to some of the largest informal settlements in the world. Kibera, for example, houses approximately 250,000 of the 2.5 million people who live in informal

settlements in Nairobi. There is a shortage of clean water and quality education in Kibera, which is just an example of a dozen informal settlements in Nairobi (Davis *et al.,* 2012).

3.3   Information Sources and Media Environment

The Communications Authority of Kenya has licensed at least 301 radio and 83 television stations (Otinga, 2014). Most of the stations are concentrated in the capital Nairobi, which boasts of the highest audience for both television and radio. In 2012, a Media Council of Kenya survey found that, overall, 85 percent of Kenyans relied on radio, 83 percent relied on television, 68 percent on newspapers, 42 percent on Internet and 41 percent on mobile phones for news and information.

The Media Council of Kenya study further found that, whereas radio is the source of news and information most relied upon in the rural parts of Kenya, television is particularly important for reaching out to people in urban areas such as the capital Nairobi. Television has an added advantage in that many people who do not own a TV set at home still manage to watch it elsewhere. Newspapers like The Nation, The Standard, The People and The Star have quality coverage of issues, including environment related stories, have a longer shelf life and have a dominant market in urban centers led by Nairobi.

3.4   Research Design

This study focused on industrial discharge in the capital Nairobi, which was selected because of its high concentration of media and industries and thus reasonably expected to have the highest amount of industrial effluent discharge. Industrial discharge, rather than discharge from households, was selected for this research because of the limited studies that have been conducted on this subject in the past. Diverse methodologies were applied to respond to the listed research objectives as outlined below:

Objective a): To determine the extent of effluent discharge by industries in Nairobi.
To respond to this objective, the researcher collected data from the National Bureau of Statistics on the number and distribution of industries in Nairobi in particular and across Kenya generally. This data of the total number of industries in Nairobi was compared with that of the industries that discharge waste effluent through the Nairobi City Water and Sewerage Company and, eventually, how many volumes the system collects

periodically. The total amount of waste effluent collected by NCWSC in cubic meters. The study further utilized data available both at the National Environment Management Authority and the National City Water and Sewerage Company (NCWSC), particularly for data on volumes of discharge and the existing treatment plants or methodologies.

Objective b): To evaluate quality of industrial effluent discharge in Nairobi and how industries manage or treat the effluents.

The study focused on three Nairobi sub counties of Embakasi North, Embakasi South and Kasarani. For qualitative analysis of a sample of the waste effluent that industries discharge in Nairobi, the researcher randomly sampled six of these industries – two for each sub county - from which samples of discharge were collected and taken to the laboratory for analysis. The samples for all the six industries were collected at discharge points of each industry, kept in small bottles, which were duly labelled, and then stored in the lab at room temperature. Three small representative samples from each industry sample was analyzed to produce three separate results and the mean of the three computed for each parameter.

In analyzing the quality of the discharge, the focus was on heavy metals such as copper, Iron, Lead, Tin, Zinc and Chromium. The process of analysis and detection involved digesting waste water samples using microwave digestion in strong nitric acid. Analyses of the elements were performed using a technique known as Inductively Coupled Plasma Mass Spectrometer (ICP-MS). The digested solution was then nebulized and the sample transported to plasma. High temperature plasma produced the ions, which were introduced into the mass spectrometer. The mass spectrometer sorted the ions according to their mass-to-charge ratio and the ions were then quantified with an electron multiplier detector to produce results.

The laboratory findings were subjected to anova and presented in a table in relation to the research hypothesis. Following a request from NCWSC, the names of the industries whose data was collected and analyzed have been concealed.

Objective c): To assess the knowledge, attitude and perceptions of key stakeholders in relation to industrial effluent.

This objective was addressed by use of a survey on different interest groups. The questionnaires, for example, were administered to communities living near industries

within specific Nairobi neighborhoods such as South B and Mukuru Kwa Njenga neighborhoods.

These neighborhoods were selected because they either have high concentration of industries near them or are neighboring areas with high concentration with industries. Other questionnaires were administered to media practitioners and non-governmental organization officials. With these questionnaires, the research sought to evaluate their knowledge and experiences with industrial effluent and the rate at which regulatory institutions such as NEMA have responded to concerns about industrial discharge.

Other questionnaires were administered to the officials of industries, which were randomly selected across the capital Nairobi. These questionnaires sought to know levels of effluent discharge from specific industries, their treatment methods for the discharge and the chemical composition of the discharge. The industries were randomly selected for questionnaires. Overall, 580 questionnaires were issued, which is considered representative enough for surveys on populations of less than one million people in a demographic group such as Kenya's (NBS, 2015).

With regard to data on knowledge and perceptions of the key stakeholders, including those residing near industries, environmental civil society groups and managers of industries, the researcher used the Kish Grid collect sample in Nairobi's Embakasi East sub county, Embakasi South sub county and Ruaraka sub county. The sub counties were randomly selected because they have residential areas with close proximity to industries, and these residential areas were Mukuru Kwa Njenga, Pipeline and Baba Dogo. In each of these residential areas, the Kish Grid was applied in the manner below in selecting the research sample.

First, a landmark to show the starting point of the survey was identified then the first household was selected for interview and thereafter households were selected in intervals of four. Within the household, respondents were selected by, first gathering together everyone that met the eligibility criteria, such was above the age of 18. Where there was only one person that met the eligibility criteria, that person became the primary survey respondent.

Where several people in the household met the eligibility criteria, the interviewer collected the age and gender of everyone that was eligible for the survey after which

they were all placed in a selection grid. The researcher then chose the respondents based on the place in the grid at intervals of four. The process was repeated for each sampled household in three study locations in Nairobi – Mukuru Kayaba, Baba Dogo and Pipeline settlement areas – as well as for the other key stakeholders ie the civil society (NGO) leaders, journalists and the industry managers.

This is partly because the study was not only meant to look at the quantities and quality of effluent waste management in Nairobi, but also to go further into evaluating the knowledge and perceptions of the Nairobi residents on how effluent waste was being managed, and thus it necessarily sampled areas where residents had the highest chances of coming into contact with industrial wastewater as well as media. The involvement of the residents was premised on the view that their participation is dependent on the level of environmental consciousness, which is an aspect of environmental conservation that the mass media has the capacity to bolster.

Purposive sampling was relevant during the study to target key informants for interviews in sampled areas with industries that were releasing effluents to the immediate environment.

Those sampled included two officials of NEMA, an official at the ministry of environment, an official at the Water Services Regulatory Board, an official at the National Bureau of Statistics and an official of one of the Nairobi based companies that imports, an environmental journalist, a staff of an NGO that works on environment issues and sells hardware for industrial waste management technologies.

Other than the questionnaires, key informant interviews were conducted with officials of regulatory institutions such NEMA, the Nairobi County government, Kariobangi treatment plant and the Nairobi City Water and Sewerage Company. The officials were regarded as experts in the field with useful information for the research, thus the choice for key informant interview format so that as much relevant information as possible could be extracted from them. This study also used media content analysis to evaluate the media coverage of issues of industrial discharge for the five-year period between 2010 and 2014.

Objective d): To determine the frequency of mass media coverage of issues relating to effluent waste management in Nairobi.

The study focused on The Standard and The Daily Nation, two leading newspapers in Kenya. Newspapers rather than radio or television were chosen because of the cost implications of accessing the past content. It is much cheaper to access past newspapers than library tapes for radio and television content, but the outcome is just as accurate.

The study, which sets out to collect data on industrial discharge in Nairobi, media coverage and public knowledge and perceptions on the same, adopted various procedures for collecting the relevant data. The challenge identified by this study is the dearth of data or even more recent pieces of research on the subject; the inadequate media, and therefore public, focus on the challenge of industrial discharge in the capital Nairobi, which in effect impacts knowledge and perceptions by members of the public.

Objectives e): To evaluate the relationship between national policy reviews and law enforcement changes with media coverage.

To address this objective, the study reviewed environmental management laws, waste management laws, water regulations, laws and various government policy documents. The study further looked at the performance of regulatory bodies and the extend of enforcement of the waste regulations and laws. To determine media coverage, a content analysis of the two newspapers under study was carried out to establish how the media houses covered the issue of industrial discharge within the period of study.

3.5   Research Tools and Methodology

This study adopted descriptive research approach to realize the outlined objectives. First, a structured questionnaire was adopted. The questions were specifically designed to provide insight on the extent of effluent waste emissions by industries in Nairobi. The questionnaires targeted industry managers and officials of the regulatory bodies, such as the National Environment Management Authority (NEMA - Kenya), Nairobi Water and Sewerage Company (NWSC) and the Ministry of Environment. Other questionnaires were issued to Nairobi residents in order to evaluate the public perceptions of the actual waste management practiced by industries. The other methodological approach was the application of one-on-one interviews with key informants from the Ministry of Environment and other regulatory agencies.

The purpose of this was to get more in-depth discussions, and thus more detailed data, on the extent of effluent waste emissions by industries in Nairobi. The last methodological approach was the review of available publications and research papers, also known as desk review, on the subject, in a bid to evaluate the extent of effluent waste emissions by industries in Nairobi. The premise here was that, in order to evaluate and understand the efficacy of effluent waste management, there has to be knowledge of the extent of emissions of the waste.

Further, in order to evaluate and understand the contribution of the mass media towards effluent waste management, the inquiry needed to start from the level of emissions and the quantities of waste that needed to be handled at any given time before the input of media can be effectively assessed. Desk review was also used and was useful in getting available information and previous studies on waste management and the media in Nairobi.

The other methodological approach was newspaper content analysis, as a result of which the study was able to evaluate the frequency of coverage of effluent waste; the prominence accorded to the stories that eventually make it to the pages of the newspapers and the depth of the stories that are published by the stories – the issues the stories are focusing on and how they understand and thus treat the external dynamics surrounding them.

3.6   Sampling techniques and Sample Size

From the design of the study, it followed that the sites of the study sample should be generated from some of the groups that had been identified as subjects of the research. The sites thus included the Kenyan media, particularly The Daily Nation and The Standard, which are all headquartered in Nairobi, which was the primary research site. In specific terms, however, the study came down to the industrial regions of Nairobi, especially those, as pointed out in the study design, that have residential areas near industries. This meant singling out settlement areas such as South B, Mukuru Kayaba, Baba Dogo and Pipeline settlement areas within Nairobi.

This is partly because the study was not only meant to look at the question of effluent waste management in Nairobi, but also to go further into evaluating the notions of the Nairobi residents on how effluent waste was being managed, and thus it necessarily

sampled areas where residents had the highest chances of coming into contact with industrial wastewater. The involvement of the residents was premised on the view that their participation is dependent on the level of environmental consciousness, which is an aspect of environmental conservation that the mass media has the capacity to bolster.

The sample for the questionnaires that were administered for this study thus came from the sites as identified above.

3.7   Data Collection

The study employed a number of methods: questionnaires, direct observations, interviews to document reviews, which in the end generated invaluable qualitative and quantitative data. In the subsequent sections below, specific details of data collection methods that were applied in this study are described.

3.7.1   Discussions and Interviews

In this study, part of the data was collected through scheduled interviews and discussions with key informants and stakeholders such as Nairobi City Council, National Environment Management Authority, Mazingira Institute, Ministry of Environment officials, officers of the United Nations Environment Programme (UNEP), selected managers of various industries and known personalities dealing in the environmental management and pollution control issues.

The study was designed to enable the researcher to carry out extensive discussions with the key informants on the subject of effluent waste management in Nairobi and its evolution over the years. But, scheduled interviews were held with media managers and environmental journalists on the contribution of the media in the management of effluent waste from industries. The discussions and interviews focused on a number of issues, including current practices of effluent waste management, the challenges the city faces in effluent waste management, effluent waste statistics and contribution of mass media coverage towards effluent waste management in Nairobi.

3.7.2   Analysis of Documents and Reports

Currently available documents and reports on effluent waste were analyzed and reviewed. This included reports and publications of the Ministry of Environment, UNEP, Nairobi City Council, NEMA – Kenya, World Bank and Environmental Impact

Assessment reports, on effluent waste in the country in general and in Nairobi in particular. These reports were deemed relevant, as they would help shed light on effluent waste statistics, the challenges of management and possible solutions.

3.7.3 Observations

The study also paid particular attention to the methodologies of effluent waste management and the prevalent waste conditions in the selected industries. This was considered necessary as a way of providing insights into the possible environmental impacts and possible required solutions; areas that are critical in enabling us to determine the weaknesses in effluent waste management practices.

3.7.4 Public Survey through Questionnaires

This involved the administration of structured questionnaires with, both open – ended and closed-ended questions on random samples of populations' resident near the industries chosen for this study. The manner of the determination of the size of the samples for the questionnaires has already been explained above. The questionnaires were administered with the aim of obtaining primary data on quantities, sources and composition of effluent waste generated; effects of the generated effluent waste on the population; management practices of the effluents by the industries in question as well as the contribution of the mass media in the management of the effluent wastes generated. Two enumerators were trained on how to administer the questionnaires. Then the enumerators, together with the researcher, carried out a pre-test of the questionnaires by administering to some minute sample, mainly for the residents near industries. The results obtained from the pre-test, were then used to make some modifications on the questionnaires, before the actual data collection began.

3.8 Data Analysis and Interpretation

Data was analyzed and processed immediately at the end of each phase of the research. Questionnaires and other field notes were carefully reviewed and edited to ascertain their validity and reliability. The research employed qualitative and quantitative data analysis techniques, since, first, the structure and nature of this research was found to favor this kind of methodology since both qualitative and quantitative data was generated. Secondly, while qualitative methods are usually considered strong on validity, quantitative methods are normally considered strong on reliability. The logic

here was that a combination of the two methods would balance out and thus improve the quality of the research. The data was analyzed using the statistical package for social sciences (SPSS), student version, in order to produce charts, graphs and other descriptive functions.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1   Introduction

This section contains the presentation of findings from desk reviews, observations, administration of questionnaires and interpretations of the analysis of the collected data. This section begins with analysis of the information from desk reviews and one – on – one interviews with key informants on the legal environment, the media and the regulatory bodies entrusted with the task of enforcing the law and guidelines on wastewater management in the city/the country. This section generally finds that, even though there might be loopholes at the levels of the administrative structures and the law, or even because of that, the concerned authorities have not adequately enforced the existent law. The mass media has similarly not paid sufficient attention to the issue of management of waste or industrial effluent in Nairobi.

4.2   The Regulatory Environment

4.2.1   Overview

There are a number of pieces of legislation scattered around the Kenyan statute books and the bylaws of the City Council of Nairobi that are directed at improving environmental sanitation, although only a few of this attempt to directly address the question of effluent waste management. But there are other better-known pieces of legislation like the Environment Management Coordination Act (EMCA), that have direct influence on the management of effluent waste in the country in general and in the city of Nairobi in particular. The newly promulgated constitution has elaborate provisions on land, environment and water and this should go a long way in boosting the other available provisions like EMCA, which will themselves need to be amended in order to align them with the new constitution (Okello *et al.,* 2009)

Kenya's EMCA 1998, is however just a general framework law that is supposed to provide general guidelines for environmental conservation and does not specifically seek to address the question of wastewater management. Instead, it provides for the establishment of an appropriate legal and institutional framework for the management of the environment and related matters. The Act attempted, at the time of its formulation in 1998, to improve the legal and administrative co-ordination of the many initiatives across various sectors with the aim of improving the capacity of the government to

manage the environment. There are other pieces of legislations adopted since the enactment of EMCA that have a direct bearing on the management of waste effluent from industries in Kenya (Kamau, 2011)

4.2.2 Waste Management Regulations

Along with the water quality regulations, the Minister for Environment and Natural Resources also published waste management regulations in 2006. The purpose of the Waste Management Regulations was to streamline the handling, transportation and disposal of various types of waste. And like water quality regulations, waste management regulations were formulated with the aim of protecting human health and the environment. The regulations emphasize waste minimization, cleaner production and segregation of waste at source. It was founded on the understanding that currently, different types of waste are dumped haphazardly, posing serious environmental and health concerns.

The regulations have classified various types of waste and recommended appropriate disposal methods for each waste type. Under these regulations, NEMA – Kenya licenses transporters, incinerators, landfills, composers, recyclers and transfer stations. Facilities to be licensed include local authorities, transporters and handlers of various types of waste. The licensing employs a risk-based approach by concentrating on facilities considered to pose a high risk to the environment. The Waste Management Regulations also provide an opportunity for investment in various aspects of waste management (Monyoncho, 2013). The regulations have certain specific yet very stringent provisions. Those emitting effluent discharges to the environment are, for example, required to state the types of waste that are supposed to be disposed of at a treatment plant – they are supposed to state whether the waste is hazardous, domestic, industrial or biomedical. They are also supposed to state the quantity of waste they dispose of per annum, besides indicating the type of treatment and facility to be used at the treatment plant.

4.2.3 General Observations Inferred from the Study

This study finds that contrary to the general perception, the legal regime on waste effluent from industries and the fact that the law is not being followed to the letter could be attributed to the weaknesses of the regulatory authorities whose duty is to enforce

the law. This is not to deny the fact there could loopholes or weaknesses in the existing law. The magnitude of the weaknesses in the law and how this contributes to the poor waste management practices can only be determined if and when the existing law will be fully implemented, including when the available oversight mechanisms have been fully utilized.

4.3   Oversight Authorities

Because of the cross-cutting nature of the issues of environmental conservation in general and effluent waste in particular, the jurisdiction and even the responsibility for the enforcement of the law and regulations touching on the same would ordinarily fall onto the laps of a number of government departments and ministries.

4.3.1   Relevant Ministries, Departments and County Government

The question of effluent waste management should naturally be of concern to the Ministry of Environment and Natural Resources. The ministry should generally be well informed, if not deeply involved, in how such waste gets managed – treated and discharged – in the country. In any case, by virtue of its wide health hazards, the Ministry of Health cannot ignore the matter, as it has the capacity to lead to an increase in the cases of water borne diseases and thus have a direct impact on the health budgets. Further, the fact that waste effluents ordinarily impact on the quality of water therefore means the Ministry of Water cannot ignore its significance, as indeed has been the case in other countries around the world. Ministries of health are directly concerned with questions of water quality and the management of effluent wastes.

Taking a view from the municipal dimension, however, means that the City Council of Nairobi, to the extent that it manages waste effluent from households that go through its sewerage systems and also that it has a public health function, should have a direct interest in how the effluent waste generated by industries in the city is being managed. The other ministries and departments should equally retain some interest, even if just peripheral, in the matter of industrial effluent waste management. The Ministry of Energy, for example, should be keen in the sense that part of effluent discharge could be a source of biogas, even if on a minimal scale.

The Ministry of Education should be concerned with the manner of management of industrial effluent should it pose a risk to the school system, while the Ministry of

Agriculture should have direct interest since the manner of management of industrial effluent has the potential to impact on land use systems or practices and thus the agricultural output (Ojanji, 2014). The office of the Attorney General and the Ministry of Justice should be directly concerned with the question of industrial effluent discharge management in the country, whether for the simple reason that the law exists and is not being enforced or that there is actually no comprehensive law to address some of the challenges in the sector.

4.3.2   Regulators Failing To Take Responsibility

The reality found in the course of this study should be of great concern to the environment sector. The Ministry of Water, for instance, maintained that issues of waste effluent do not fall within the Ministry's mandate and thus it could not respond to questions of how industrial discharge was being managed. The Ministry maintained that it only deals with matters of policy and had nothing to do with the specific enforcement of regulations on water. The Ministry of Water told this researcher it does not have any data on waste discharge from industries in Nairobi that would pollute water sources, which would mean that the Ministry would find it difficult to even start to respond to such challenges. The ministry referred this to the Water Services Regulatory Board.

The Water Services Regulatory Board, on the other hand, argued that it only deals with water sources and water service provision (supply) and not waste discharges from industries, a matter the board preferred to refer to the Ministry of Environment. Officials at the Ministry of Health – both Public Health Ministry and the Medical Services Ministry – argued that the ministry is supposed only to provide medical services – facilities, drugs, policies and oversight functions – to the sector and does not therefore concern itself with effluent discharges from industries, equally pointing out that such matters are the function of the Ministry of Environment (Muthaka *et al.,* 2004)

The Ministry of Health therefore equally lacks any data on industrial discharges, even the toxic ones that would course serious health hazards, or even the general list of industries that would emit effluents into the environment. Such a list was to be found with the Ministry of Trade, which only keeps it as a list of businesses or investors in the country, with little attempt at looking at the environmental dimensions.

The Ministry of Environment however stuck to a rather conservative interpretation of the law and its mandate, arguing that the ministry only deals with the formulation of policies and laws as well as offering oversight services to the sector. The functions of the enforcement of laws on environment, and thus determining who was flouting which law, fall within the purview of the National Environment Management Authority. The management of industrial waste discharge, including data of which industry discharges what effluent to the environment and what level of treatment the effluent is accorded before discharge, is the mandate of NEMA – Kenya and the Ministry does not therefore keep such data. The City Council of Nairobi insists it delegated its waste water (meaning sewerage functions) to the now semi-autonomous Nairobi Water and Sewerage Company which says it deals only with sewage that goes through its sewerage systems and does not deal with all cases of industrial discharge.

Indeed, and as noted above, by law NEMA – Kenya is supposed to keep such data and also enforce the law by prosecuting and meting out direct minor punishment to offenders, as prescribed by the law. But NEMA – Kenya indicated that only a handful of industries have been filling in the mandatory quarterly records as required by law. NEMA - Kenya argued that this process is voluntary and only those industries that offer to do it should do it. Majority of the industries in Nairobi, and presumably in other parts of the country, do not file the quarterly records (Wang'ombe, 2013)

Therefore, whatever data NEMA – Kenya has on industrial discharge, and thus the chemical contents of such industrial discharge, that are being emitted into the environment – the kind of data NEMA - Kenya is reluctant to share with researchers – is incomplete and thus unreliable for any comprehensive study on the state of industrial effluent discharges into the environment, whether just for Nairobi or the country at large. The fact that NEMA – Kenya attempts to obscure such data from public scrutiny, academic or otherwise, is in itself a violation of the provisions of the new constitution on information flow. But what this section seeks to show is that, the existent law has not been adequately enforced and that the failures are to be found in the regulatory authorities that are supposed to enforce the law on effluent discharge by industries.

The deficiencies in the management of industrial effluent discharge are therefore directly attributable to the failures of the law enforcement agencies, including NEMA – Kenya. But other sector players have attributed the failure of the laws and regulations

for waste management in Nairobi to a number of handicaps, especially on provisions and sanctions to deal with those who flout them, weakness of the related agencies and the inability or unwillingness of officials to enforce such laws (Kazungu, 2010).

4.4   Quantities of Industrial Effluents in Nairobi

The study found that, although Nairobi has two wastewater treatment plants, the county authorities say they do not compute quantities of discharge either per sector or overall. The Dandora/Ruai sterilization ponds treat both industrial effluents and domestic sewage. It has a design capacity of 80,000 cubic meters per day and constitute the largest pond system in Africa. The Kariobangi wastewater treatment plant has a capacity of 32,000 cubic meters per day and uses the trickling filter technology. This makes a total of 112,000 cubic meters per day of effluents from both plants that is ultimately discharged into the Nairobi River. However, since Nairobi county authorities estimate that at least 6 percent of the effluents are from industries, the total industrial discharge per day can be computed as per the table below. Of all the effluents from industries, an estimated 60 percent is from the processing and general industries while the rest is from Fats, Oils and Grease (FOG) type of industries – such as hotels and petrol stations. Table 4.0 below the volumes of industrial discharge for the 600 industries that discharge their effluents into the NCWSC system.

Table 4.0: Estimated Volumes of Industrial Effluents in Nairobi (cubic meters)

No.	Category		Emissions per day	Emissions Per month	Emissions per Year
			Cubic meters	Cubic meters	Cubic meters
	Dandora/Ruai Plant		80,000	2,400,000	28,800,000
	Kariobangi Plant		32,000	960,000	11,520,000
	Total waste at NCWSC Plants		112, 000	3,360,000	40,320,000
	Industrial discharge	For 600 industries	6,720	201,600	2,419,200

Source: Nairobi City Water and Sewerage Company

Table 4.0 above shows the total amount of effluents that go through sewerage and treatment system of NCWSC. But, according to NCWSC officials, only 6 percent of this waste comes from the 600 industries that discharge into the NCWSC system. This

means that, 600 industries that treat their effluent through the NCWSC system discharge a total of 2,419,200 cubic meters of waste into the Nairobi City Water and Sewerage Company system.

4.5 Data on the total number of industries in Nairobi

The study found that, by July 2016, data from Kenya Bureau of Statistics (KBS) was showing that Kenya had a total 4, 861 industries, all classified by KBS as manufacturing industries. At least 54 percent or a total of 2,625 of these industries are found in Nairobi. More than 60 percent of all the industries in Kenya are manufacturing food or related products. It is however difficult to assess the concentration of industries within Nairobi, as the data does not contain specific information about the location of each industry within Nairobi. The study further found that this data varies from that of the Nairobi City Water and Sewerage Company (NCWSC), which has records of just 1,519 industries in Nairobi. The difference is likely due to either variation in the way the two organizations categorize entities as industries or it could be more of a reflection of the lack of rigor on data management by the Nairobi City Water and Sewerage Company.

The study further established that, of the 1, 519 entities NCWSC has listed as industries, just 600 industries discharge their waste effluent into the sewerage system of the NCWSC, which first treats the discharge at its two treatment plants in Ruai and Kariobangi before releasing into the environment. NCWSC officials told the researcher that only the 600 industries that discharge into its sewerage system are licensed to do so. The licensed industries are required to file during every quarter analyzed samples showing the quality of discharges.

Going by data the researcher acquired from Kenya Bureau of Standards, this means that at least 2,025 industries in Nairobi do not discharge their waste effluent into the NCWSC system for treatment. In an interview for this study, an official of the NCWSC attributed the gap to, one, lack of cooperation from industries and, two, the fact that NCWSC lacks necessary powers, as per the law, that would either compel industries to comply or be penalized, and that such powers are vested in NEMA. NEMA officials did not share data of the industries that are compliant with waste management requirements, only describing the data as scanty (meaning that just a few industries comply).

Table 4.1: Distribution of Industries and treatment of effluents.

No.	Item	Quantity
1.	Total no. of industries in Kenya	4,650
2.	Total no. of industries in Nairobi	2,625
3.	No. of industries not discharging into NCWSC system	2,025
4.	No. of industries licensed by NCWSC	1,519
5.	No. of industries discharging into NCWSC system	600

Source: National Bureau of Statistics and Nairobi City Water and Sewerage Company

4.6 Analysis of Qualities of Industrial Effluents in Nairobi

Samples of effluents from six Nairobi based industries that discharge into the NCWSC sewerage system, which were sampled randomly, two industries from each of the three research sub counties of Embakasi South, Embakasi North and Kasarani. The samples were collected and analyzed in the laboratory. The analysis focused mainly on the levels of BOD, COD and heavy metals (details of how the analysis was done have been discussed in the research design section). Table 4.2 following below shows the presentation of results – the mean after three tests per parameter for each sample - from the analysis:

Table 4.2: Analysis of effluents from sampled industries in Nairobi.

Parameter	NEMA Limits	Ind. 1	Ind. 2	Ind. 3	Ind. 4	Ind. 5	Ind. 6
pH	**6.0-9.0**	9.20	6.30	7.93	5.33	7.12	7.20
BOD	**500**	81.0	480.00	5.38	2050.0	30.6	115.4
COD, mg/l	**1000**	240.0	23	8.30	6147.0	76.80	197.0
Zinc, Zn, mg/l	**5**	0.100	0.01	0.200	<0.01	<0.01	0.100
Lead, Pb, mg/l	**1**	<0.01	<0.10	0.01	<0.01	<0.01	<0.04
Copper, Cu, mg/l	**1**	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Cadmium, mg/l	**0.5**	<0.01	0.03	0.02	<0.01	<0.01	<0.01
Chromium, VI, mg/l	**0.05**	<0.01	0.01	0.03	<0.01	<0.01	<0.02
Mercury, mg/l	**0.05**	<0.01	0.02	0.03	<0.01	<0.01	0.02
Arsenic, AS, mg/l	**0.02**	<0.01	0.03	0.02	<0.01	<0.01	<0.01

Source: The Author, Jan and March 2019.

Table 4.2 shows effluent pollution levels sampled from six industries in Nairobi. The sampling and analysis was done at room temperature of around 24C. The sampled collection points were industry 1, industry 2, industry 3, industry 4, industry 5 and industry 6, all being known industries within Nairobi. Among the parameters that were measured were PH levels, BOD, COD, and heavy metal pollutants.

In analyzing the quality of the discharge, the focus was on heavy metals such as copper, Iron, Lead, Cadmium, Mercury, Zinc, Arsenic and Chromium. The PH levels, BOD and COD were also analyzed. The process of analysis and detection involved digesting waste water samples using microwave digestion in strong nitric acid. Analyses of the elements were performed using a technique known as Inductively Coupled Plasma Mass Spectrometer (ICP-MS). The digested solution was then nebulized and the sample transported to plasma. High temperature plasma produced the ions, which were introduced into the mass spectrometer. The mass spectrometer sorted the ions according to their mass-to-charge ratio and the ions were then quantified with an electron multiplier detector to produce results.

The pH levels from all collected industries had the highest as 9.20 and lowest as 5.33. What these results show is that chemicals like heavy metals are present and, in some cases, are in excess of their specified limits by NEMA even in the treated effluents. This finding is in line with previous research findings of other scholars such as Burton and Tchobanoglous (Burton et al, 1991). Other scholars have posited that a large number of small scale industries, especially in developing countries, do not have effluent treatment plants and do not adhere to the regulations imposed to keep a check on the level of pollution, either due to lack of awareness, space, technical manpower or due to shortage of funds (Corcoran, 2010).

As per the results, the released effluents varied in different sampled industries. The results showed that the amount of pollutant particles varied in industries sampled depending on the nature of effluent generated. Different sampled industries had variations of metal presence levels. Every component severity was determined on its higher levels in a sampled industry.

The industries whose waste effluents were analyzed are in fact part of the 600 industries that discharge their effluents into the NCWSC, which means their compliance levels

are higher. Yet the results still show that indeed the pollution levels from industrial effluents find their way into the environment, and especially into the rivers. These pose health threat to human and other aquatic animals, cause habitat destruction and direct environmental degradation. When the raw data from the six industries was subjected to Anova for analysis, the levels of pollutants were insignificant:

Table 4.3: Anova's single factor analysis for the six Nairobi industries.

ANOVA: Single Factor								
DESCRIPTION					Alpha	0.05		
Group	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
One	10	330.27	33.027	5926.424	53337.81	240.9858	-448.545	514.5986
two	10	509.51	50.951	22778.74	205008.7	240.9858	-430.621	532.5226
three	10	21.93	2.193	12.51885	112.6696	240.9858	-479.379	483.7646
four	10	8202.4	820.24	3917800	35260201	240.9858	338.6684	1301.812
five	10	114.59	11.459	619.1343	5572.208	240.9858	-470.113	493.0306
six	10	319.81	31.981	4661.13	41950.17	240.9858	-449.591	513.5526
Nema	10	1515.12	151.512	113391.6	1020525	240.9858	-330.06	633.0836
ANOVA								
Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	5273095	6	878849.1	1.513323	0.188382	2.246408	0.389014	0.042145
Within Groups	36586707	63	580741.4					
Total	41859802	69	606663.8					

Accept H0 – Do not reject H0 because 1.513<2.246. P value is greater than alpha (0.05). This shows, therefore, that there is no statistically significant difference between means of the industries to show that there is a difference in quality of effluent discharge from the industries.
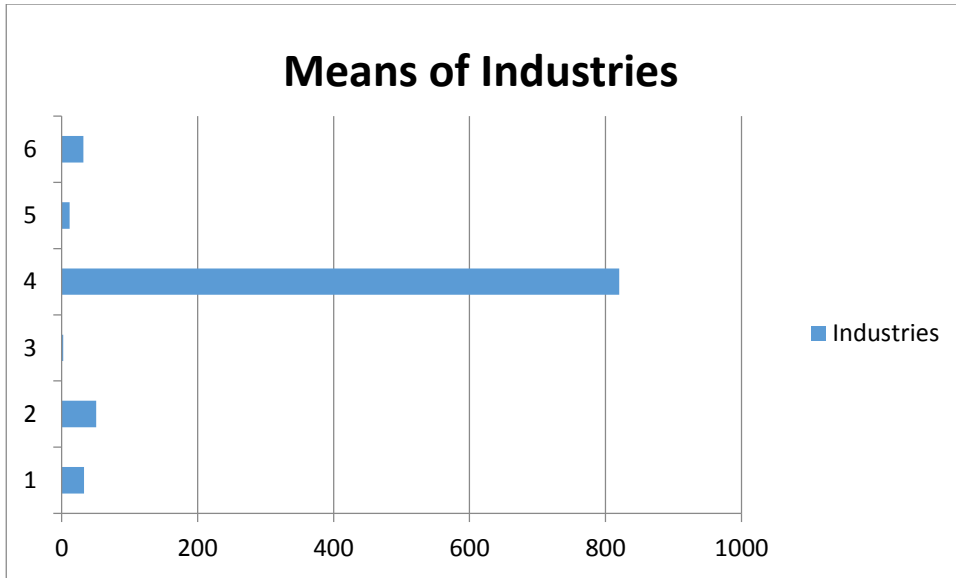
Figure 4.1: Means of industries

This shows that there are outliers, especially with regard to industry four, in respect of the NEMA limits. It means that industry four had more pollutants as compared to the other five industries sampled. This finding can be demonstrated by figure 4.2 as well:
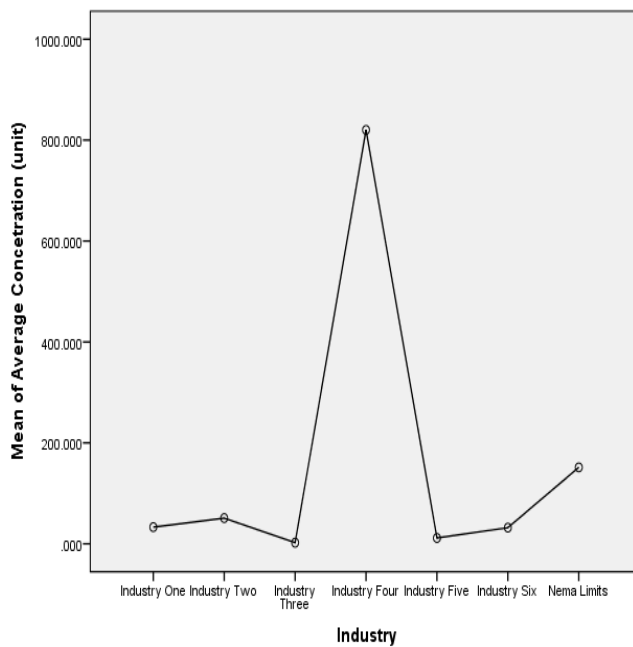

Figure 4.2: Graph on means of industries

As a precaution, these results merely reflects the situation in about 600 industries that treat their waste through the NCWSC system. In other words, the results analyzed here do not capture the situation in the 2025 industries that do not discharge into the NCWSC system – i.e those that do little or nothing to comply with regulations. It is likely the pollution levels among industries that do not discharge into the NCWSC system might be much higher or worse than depicted in this study.

4.7 The Media Coverage

For all the five-year period chosen for this study, the question of environment appeared to be regularly covered by both The Standard and The Daily Nation, both of which have had an on and off environmental pull out, in most cases just referred to as the science pages. Most of the environmental stories, as would be seen in the graphic analyses later in this study, are about forests or agriculture, or even simply the health implications of polluted water. There is little attempt by both the Daily Nation and The Standard at identifying sources of pollution or even recognizing poor handling of wastewater from industries as a health hazard. In general terms, the subject of effluent waste, especially with regard to industries, is scantily covered.

Earlier in 2000, however, there was an attempt by The Standard at a more detailed coverage of the subject. The four-page pull out, titled Polluted Rivers, looked generally at the subject of pollution on Kenyan rivers around the country and the issue of waste effluent was discussed in greater detail than ever seen in the Kenyan papers. Although it was the most detailed coverage of the subject ever to be seen in the local media, the quality of coverage of industrial effluent, Nairobi or otherwise, and the management of waste effluent in the city, was poor.

It however captured the problem of failure to enforce the laws and discussed the EMCA Act, which had just been enacted the previous year, in some detail. It was notable, though, that the said newspaper article did not look at the problem of pollution holistically, failing to even mention the contribution of poor planning (Ojanji, 2014), haphazard industrial expansion in the city and encroachment of industries into settlement areas as posing equally serious challenges to the management of wastewater from industries.

Since then, however, there is barely recognizable media coverage of the subject of waste effluent, let alone an attempt at zeroing in on industrial discharge. On the few occasions where it has appeared, it has tended to be pegged on the ongoing and UNEP supported clean up exercise of the Nairobi River, which started in 1999 (Ibid). Even though the Nairobi river project has detailed chemical data on the chemical composition and the extent of the pollution of the water right from the source, the media coverage appeared to mainly center around the participation of top government officials. Media editors argue that this is what sells newspapers rather than a heavy focus on the scientific aspects of the industrial discharge.

Indeed, the coverage of effluent waste and water pollution for the media in Kenya, especially where the focus is Nairobi, is almost synonymous with looking at the pollution of Nairobi River. But it has been argued that the high-level participation of government officials in the clean-up of Nairobi river could be directly linked to the attention the media has paid to the subject of pollution of Nairobi river by industries and slaughter houses upstream (Kazungu, 2010). If this is the case, therefore, it would be a classic example of how the relevant authorities or even environmental lobby groups and academics could utilize the media to elicit responses from senior government officials, or even influence the direction of policy and administrative decisions in the interest of environmental sanitation.

But that would require that the capacity of the media to handle environmental stories, or even to dissect and disseminate issues on wastewater to the public, is enhanced either through direct training or simply assisting media to access the right information (Ibid). This is so because, even though the stories might indeed mention that it is the industries that have polluted the rivers in Nairobi, and through this attract government responses, they barely go further than that, and even where it is done, it is far in between.

A review of the two newspapers for the five years reveals that, despite the retention of regular science or environment pages, there has never been a detailed and informative analysis of the challenges and implications of industrial effluent discharged untreated into the waters. Even though this review focused on just two newspapers, The Daily Nation and The Standard, the findings from a review of the two newspapers is representative of the media environment in Kenya. This is because, since The Standard and The Daily Nation were Kenya's best managed and edited newspapers between 2010

and 2014, they set a higher pace and standard that other mass circulation newspapers – as opposed to specialized publications – would not effectively challenge (Osse, 2014). What follows next is a presentation of an analysis of data collected from the field together with a presentation of findings in the form of charts, discussions and averages, and this includes findings on media and industrial effluent.

4.8 Administration of Questionnaires: The Response Rate

Sets of questionnaires were administered to four sets of respondents – the media, civil society, those residing near industries and the managers of the industries in Nairobi city – and results were received and tabulated as shown in table 4.1.

Table 4.4: Response Rate

Set of Respondents	Questionnaires Issued	Questionnaires Responded to	Questionnaires Returned Without Response	Response Rate (%)
Residents Near Industries	200	139	61	69.5
Government officials and executives of environmental NGOs	150	98	52	65.33
Managers of Industries	30	0	30	0
Editors and Reporters	200	136	64	68

Based on the available professional assessments of response rates in research, the above responses with regard to this study are generally within an acceptable range if we exclude consideration of the absolute zero returns from the industry managers. In this kind of general categorization of ratings, a 50 percent response rate is considered adequate. On the other hand, a 60 percent response rate is considered good while 70% response rate is categorized as very good (Mugenda and Mugenda, 2003).

But the worrying outcome was the zero response rate from managers of industries. The study interpreted this to mean several things. First, it might mean that the managers,

knowing that their management of waste discharges does not meet the required standards, are unwilling to discuss the subject lest they expose themselves. But it can also mean that the managers do not take the issue of untreated industrial discharge seriously, mainly due to the laxity in the enforcement of the law, and therefore brush studies in the area offhand. Yet it can also mean that the industries in Kenya having not recognized the enormity of the problem lack relevant personnel or desks to deal with waste discharge and thus, when the questionnaires were submitted to them, they did not just have the right officer to respond to the matter.

Whichever way the study has interpreted this absolute zero response from the industry managers, it has tended to point at the fact that raise more questions than answers at the way industries manage their waste discharges. This is whether it is viewed merely from the perspective of their attitude to studies in the area or even from the perspective of the pollution of the marine ecosystems around industries in Nairobi – for example Nairobi River. From the above findings, this is a subject that clearly requires further attention from the academia working on the subject in Kenya. What follows however is a discussion of other results from the field.

4.9 Response from Media Managers and Writers

For this section, the n for the sample size was resolved to be 136, mainly owing to the limited number of media managers and writers. With that sample size, it was found that all respondents had a good understanding of what the term effluent waste means and provided some definitions that included "any waste in liquid form". Others described it as residue generated during the manufacturing process in production industries". This clearly established that the respondents were relevant to the study.

In specific terms, however, a quarter of the respondents (25%) felt that effluent waste was well understood within the media, (37.5%) felt it was moderately understood while an equal proportion (37.5%) felt it was not understood at all, a problem they attributed to the obsession by media with covering political news and, to a lesser extent, business events. These percentages therefore show that the level of understanding of waste effluent within the Kenyan media has been and still is far from satisfactory, and this should partly explain the persistently poor coverage of waste effluent issues by the local media.

It should be mentioned, though, that this is just an understanding of the basics about effluent waste such as what the term actually means or even the general situation is like in Nairobi, as the study did not go into assessing the technical knowhow that journalists may have on the subject. It would be right to presuppose here that a study focusing on the in-depth knowledge by journalists, even the specialized environmental ones, on issues such as effluent treatment technologies and chemical composition of the waste discharge from industries, would come up with even lower percentages. This can be extrapolated to mean that, since the media is generally relied upon to sensitize the public, and therefore given that the quality of coverage of the subject is that low, the level of knowledge should be worse among the members of the general public than has been found in the media.

Question: Do you think this kind of waste is well understood within the media?
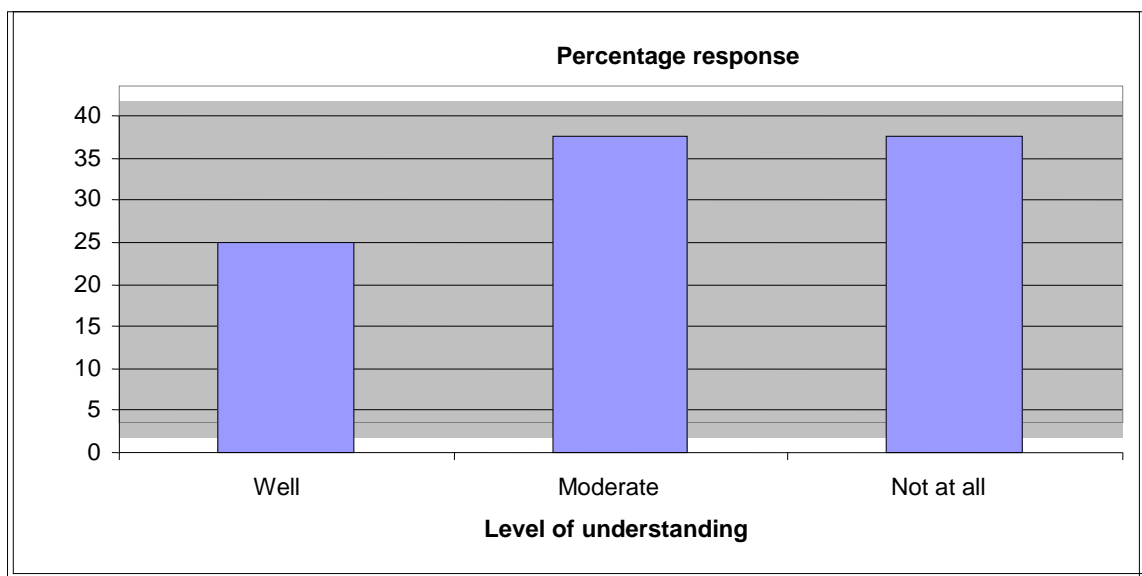
Figure 4.3: Levels of understanding

4.10 Response from Those Residing Near Industries

It has been noted in the study that the problem of industrial effluent is partly augmented by the poor planning in the city that has seen industries expand beyond the initially designated industrial area. It has also been noted that, because the city authorities have not designated more land as industrial land since 1973, industries have now expanded into residential areas. This study therefore inquired further from those who reside in areas that have been encroached into by industries about the industries that are near them and what problems these industries are posing. The study also inquired in the issue

of media and its contribution to the management of discharges from industries. In their responses, the Nairobi residents listed a number of industries as being near residential areas. Up to 120 respondents were interviewed for this question.

In the course of these study, respondents mentioned at least 22 industries – including Manji Food Industries and British American Tobacco – as being near residential areas in a manner that should not be encouraged. Some of the industries mentioned by respondents are among the biggest industries in Kenya and it should be acceptable to argue that their levels of consumption of water are as high as their effluent discharges. But, while it is true that industries in Nairobi have encroached in places exclusively designated as residential, and this with serious health implications, it should also be noted that even those areas initially designated as industrial in Nairobi have residential houses, such that there is no longer in Nairobi an exclusive area for industries. The low income earners in Nairobi, who mainly do menial jobs in the industries, said they actually prefer staying near industries where they work to lessen their recurrent expenditures such as cost of transport and housing, since most settlement areas around industries have low cost houses.

4.11 Industries Emit Effluent Waste

The study further sought the views of those who reside near industries in Nairobi whether, to the best of their knowledge, industries actually discharge effluent to the environment and the rivers near them – for some reason, most residential areas near industries in Nairobi are near rivers, all of which have been polluted by discharges from industries. The residents felt very strongly that industries discharged waste effluent into their neighborhood, with (76%) of the respondents saying so and just (12%) saying otherwise.

Only (12%) of the respondents said they were not aware of anything of the sort. It was evident that even those who said industries did not discharge effluent into the neighborhood said so only because they had not paid keen attention to the matter since, as illustrated elsewhere in this study, they would later attribute some of the water problems in the rivers to discharges from industries. This makes the problem of effluent discharges from industries one of the biggest challenges Nairobi residents could be facing, albeit with little attention paid to it either by the media or the relevant authorities.

The respondents who reside near industries, out of which (76%) felt that the industries emit effluent to the environment, were willing to even give names of some of the industries that discharge their effluent to the neighbourhood. They included Manji Food Industries, Kartasi Industries, Cosmos, Raiply, Galsheet, Mareba, RAC Ceramic, Kalu Works, BOC, Bamburi Cement, Longhorn, KCC Ltd, East Africa Packaging Industries, R.H. Devani, Smikline, Tetra Pak, Spinners and Spinners, Blow Plast and Beechams. Even though mentioned randomly by the residents, these are exactly the same industries they cited as being situated close to residential areas. This could be taken to mean that, despite the regulatory authorities not keeping exhaustive records of discharges from industries, and despite the fact that the names dropped by residents are randomly cited and not exhaustive, it is likely that all industries near residential areas discharge their effluent in the neighborhoods.

The residents were also able to directly link some ailments to the discharges from industries. In this regard, some of the highlighted effects, health or otherwise, of the effluent wastes included wounds by those who they said had come into contact with the effluent discharge from industries. The study indeed found that those residents who for some reason came into contact with the discharge from industries ended up with scars on various parts of their bodies, something that clearly shows that the discharges are untreated.

Yet, the respondents said they had neither themselves reported such cases to the authorities nor have they ever heard of a case in which any resident complained to the authorities about the effluent discharge and the attendant health effects. Such reluctance of the residents to complain or report cases of hazards from effluent discharges have been found by this study to be attributable to the following four reasons, mainly derived from responses by the respondents in this study: Majority of the respondents 37% said they no longer care about this kind or any other form of pollution of the environment because of fear of possible victimization by some of the law enforcement officials who they say have rather close relationship with the polluting industries. They could however not give any specific examples of those who have previously attempted to report and have been victimized, although they talked generally of resultant hostility from the management of the industries when reported upon.

The second reason cited by an equal proportion of respondents 37% is lack of support from the companies. The respondents indicated that, even when informed of the health hazards their discharges are causing the residents, the industries don't attempt to even find out what could have happened and whether there is anything wrong with their discharges. Instead, they resort to threatening the complainants and the victims. But the third group of respondents 16% held the view that it was upon the industries concerned to understand what their responsibility is with regard to the effluent discharge and therefore they should not wait for the residents to file complaints. It would appear that this apparent don't care attitude from a section of the public is a result of both frustration due to lack of action by the concerned authorities and also due to lack of knowledge of the civic duty a member of the public may have towards environmental sanitation.

But the responses from the fourth group 10% appears to be an apparent indictment on the regulatory bodies and the extent of law enforcement. The residents indicated that they did not see the need to complain about effluent discharge since, even in the few cases where some people have bothered to file complaints, there still was little help from the concerned authorities. The respondents felt that the officers from NEMA have been compromised by the rogue industries and are therefore incapable of taking the right actions. The findings are illustrated in the chart below: Are industries emitting waste into surrounding?
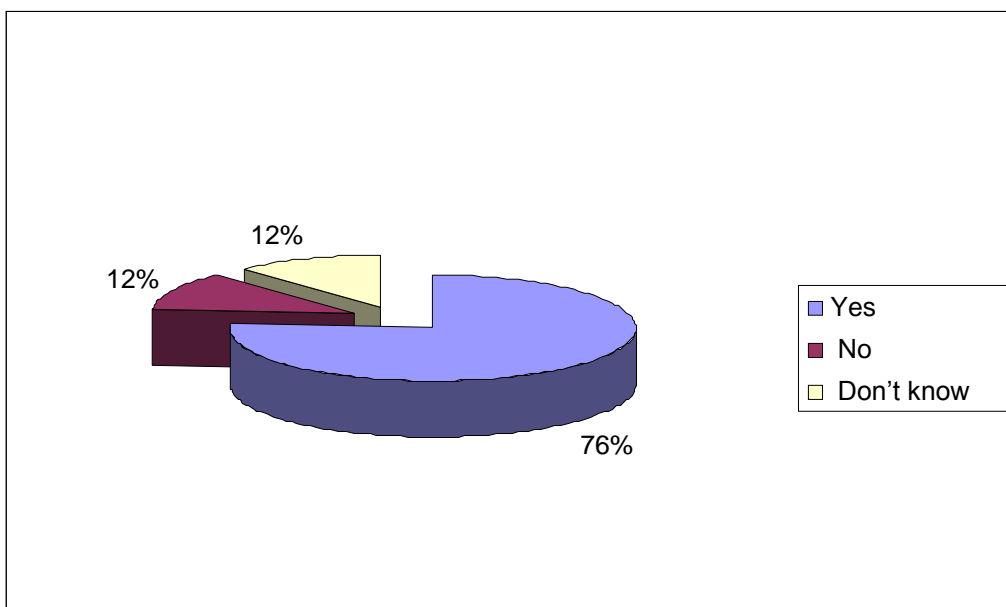
Figure 4.4: Response on Effluent Emission

4.12 Media Highlights Environmental Issues

Like in the preceding question, there were 120 respondents to this question. The responses to this question were unmistakable, as most respondents (94%) held that the mass media has not highlighted any of the environmental concerns, especially the ones relating to the management of effluent discharge from industries. Only six percent (6%) of respondents said they were not aware whether the mass media highlighted their environmental issues.

The fact that there is absolutely no one saying that the media even attempted once to highlight the above concerns is an indication that, even though the media has been noted elsewhere in this section as having the capacity to influence authorities into action, the potential from the media has not been fully tapped by the stakeholders in the environmental sanitation sub sector. It could also be a pointer to the lack of interest from the authorities in dealing with the challenge of effluent discharge from industries, just as much as it is a statement on the interest of the media in the subject matter. The two should explain why the industries in Nairobi are not exercising due diligence and thus the requisite social responsibility with regard to the management of effluent discharge.
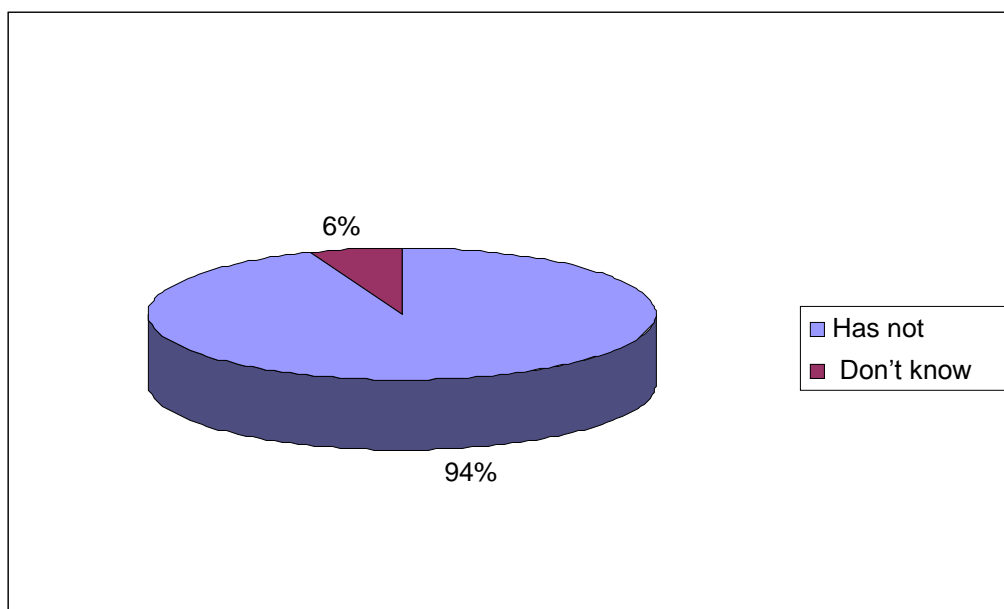
Figure 4.5: Media highlights on environmental issues.

With regard to the focus and inclination of media coverage, seventy five percent (75%) of the respondents felt the media has not at all covered the issues of the management of effluent discharge in Nairobi and other parts of the country. But even those who felt that the media indeed covered the issue of effluent discharge from industries, there was a general feeling that the articles in the mass media were either misleading or lacked depth and could therefore not influence authorities in as far as environmental issues were concerned. This group fell within the twenty five percent (25%) of the respondents who felt that, even though the media had actually attempted to cover issues of waste effluent, they did not appear to be doing it from an informed point of view. What this means is that, for as long as the media either lacks interest or churns out openly uninformed articles about issues around management of waste effluent from industries in Nairobi, its capacity to influence responses from the authorities will remain heavily undermined for long.

The respondents attributed this poor performance from the media to a myriad of factors. Some of the factors mentioned as inhibiting the media's ability to adequately write about environmental issues in general and issues of effluent waste management in particular are discussed in the subsequent paragraphs. The respondents felt that this problem could be attributed to the lack of interest among reporters for environment stories, of which waste effluent is just but a part, and the attendant obsession by both the writers and the general public, who are the readers, with politics and business issues rather than environmental issues. Independent interviews with editors for purposes of this study however found editors arguing that environmental stories, much less stories on effluent discharge from industries, are not appealing to the readers and therefore newspapers do not sell as much as they would wish to for publishing them.

This should therefore explain how this second factor, lack of interest from the editors who rarely assign their writers to follow up waste effluent stories, comes about. For, as mentioned above, the Kenyan newspapers find that not so many Kenyans are keen on reading stories on waste effluent, their health implications notwithstanding. But in addition to or even as a consequence of that very fact of none readership, the pages with environmental stories or simply stories on waste effluent from industries, would not easily attract sponsorship from advertisers. Part of the lack of sponsorship could be partly informed by the understanding that the pages lack wide readership from the

public, but part of it has been attributed to retributive action by culpable industries denying advertising revenue to media houses that write about their poor methods of managing affluent waste.

This study also found that individual journalists are equally un - attracted to the idea of focusing on issues of effluent waste management, let alone even trying to understand the technical details like the kind of technology used, since their media houses either have very little or absolutely no space for such stories. The only time journalists take interest in such stories is when there is a promise or prospect for an award or something of interest like an accident relating to effluent waste from industries has occurred and thus the individual journalist would be assured of prominent coverage.

The respondents further attributed the poor coverage by the media of the issues of management of effluent discharges from industries on lack of resources, as media houses do not want to allocate resources to such stories since they not only do not attract readership, but also have low returns owing to the fact of advertisers not shunning the pages. The respondents indicated that the fact that senior officers in the regulatory bodies, when approached for interviews on the question of effluent discharge, would rarely agree to comment on the issue was even complicating the situation. For a writer who is not motivated by the employer to pursue that kind of story, the determination to tag after a regulator or expert who is unwilling to talk about the subject will be lacking.

But what is even more important is the information of regulators running away from speaking to the media about the challenges of managing effluent discharge from industries, yet such action would clearly work in favor of best practice by shifting public attention to the actual problem. This would in turn compel the authorities to undertake the requisite action to manage the challenges. The impression created by the action of senior officers' reluctance to speak to the media is that they are not only comfortable nursing a problem but that they are also keen on concealing it from the public.

The respondents, most of who were editors and writers, also singled out the lack of specialization on environmental issues in the media houses as a key challenge. Although there are occasional environmental specialist writers, and thus an occasional drive to create environmental pullouts or inserts, the general pattern in the media has been to create a science desk that manages a few weekly science pages. Even though

the science desks are, customarily, ill equipped both technically and resource wise, it is expected to handle everything that relates to science ranging from medicine, engineering, architecture, IT all the way to environment. The trend has further been that science pages in all the newspapers have been dominated by news of medical research and public health at the expense of other sub disciplines such as environment.

Other respondents attributed the poor coverage of waste effluent to the kind training journalists receive at the journalism colleges in the country. They argued that journalism colleges do not emphasis specializations such as environmental health, biotechnology (science in general) hence creating the impression among budding journalists that these are not important genres of news. This is, in fact, a discourse on intellectual solidity of journalism as a profession, an issue that has arisen as to whether direct entry into journalism colleges from high school provides students with necessary theoretical grounding to enable them juggle with the myriad issues of varied disciplines, as is the demand of the profession.

The question then is whether journalists are better prepared intellectually to confront subjects such as environmental science or even the coverage of waste discharge from industries by first taking undergraduate training in other disciplines before joining journalism classes at the postgraduate level or by direct entry into journalism colleges from their high schools.

The other issue respondents raised is one of professional failure. Most of the industries that produce effluent discharge, as has been noted above, have a big say in what kind of news items get published. This is because they give advertising revenue to the media houses, and since advertising revenue is the lifeblood of newspapers, effluent waste producers begin to assume an important place as key stakeholders in the mainstream newspapers and thus determine what the media publishes for the public.

Respondents were also asked what they think needs to be done to improve the coverage of the mass media with respect to effluent discharge from industries. The respondents felt that media houses ought to not only improve generally on the coverage of environmental issues but also improve on its coverage of issues of effluent waste management. The respondents suggested the following that ought to be done to remedy the situation for the media. These include motivation of journalists covering

environmental issues, the encouragement of specialized environment writers in the media, promotion of independence of media houses from the advertisers and also restructuring the journalism courses to emphasis environmental journalism. They also suggested regular workshops and seminars for journalists and editors on environmental issues.

4.13 Media Houses Have Specialized Science Desks

Out of the 136 writers and editors sampled for interview, 87% said their respective media houses have a specialized environment/science desk while 13 percent said their media houses do not have a specialized environment/science desk.
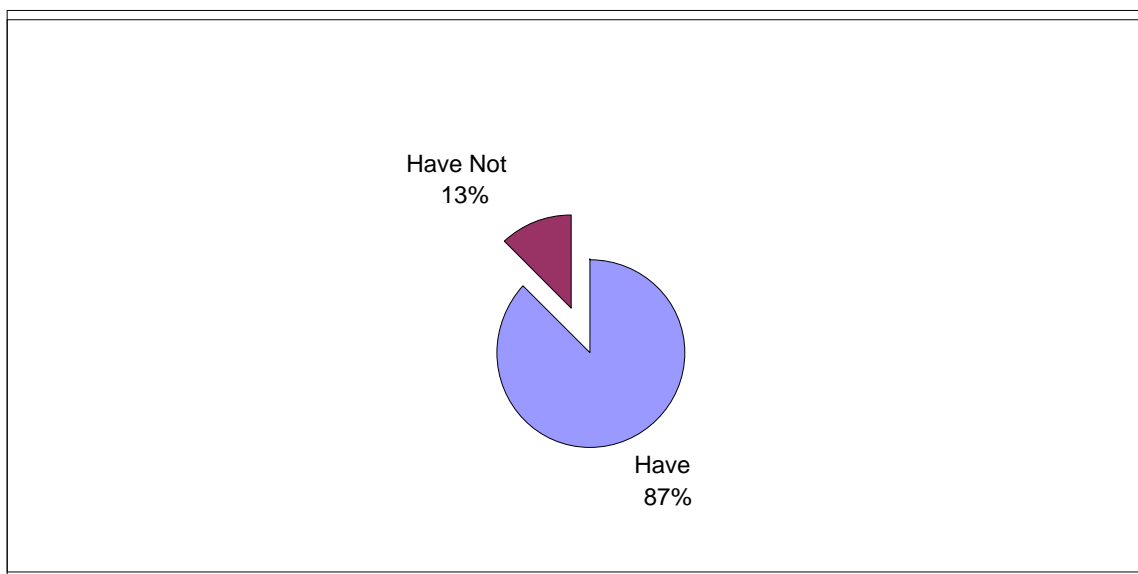
Figure 4.6: Media house specialized science desks

With regard to the staffing levels and the facilities about which the respondents were asked, majority of those interviewed said staffing level was adequate and that the staff had the relevant background education. But they expressed concern with regard to the facilities allocated, saying the facilities were not adequate for the journalists to perform well as to the priority objectives of the science/environment desks.

In most media houses, journalists complained about the lack of a clear criteria on how stories are decided upon, although they all talked of the existence of an editorial team. The responsibility of the editorial team – mainly composed of editors – is to select stories and also to brief and debrief writers with regard to their stories. They help writers to identify the weak areas in their stories and thus strengthen them. Although some

editors insisted stories are selected on the basis of merit, some of which may have been assigned in advance by the editor or are selected on delivery for publication due to their perceived impact on society, up to 12.5 % of writers said that, even though the criteria might sound very clear on paper, in practice it has never been clear to them the basis upon which stories get selected for publication.

The respondents here also acknowledged that stories on effluent waste are rated by media as less competitive compared to the stories on politics and business. The reason provided, again, was that the audience seems more attracted to political, sports and business news rather than environmental news, much less stories on wastewater management. For, the journalists who have been able to get environmental stories published, however, named their main sources of information as including residents, public relations officers in various organizations, non-governmental organizations, United Nations agencies, scientific reports, National Environmental Management Authority and visits to waste or effluent discharge sites. But the journalists revealed that such stories were not regular, meaning low frequency, with some saying the stories could come on a weekly basis in pullouts, others on monthly basis while still others felt they were publicized whenever and if the stories came in.

Respondents said that some of the industries mentioned as major polluters usually respond to the stories against them by either denying responsibility or threatening to sue the journalists, otherwise very few industries comment on the reports - and again this is only if they are positive. The reactions from the government officials, law enforcers and policy makers indicate that they are usually very happy when the stories are positive, but feel incompetent and thus become defensive when the stories are negative like exposing cases of untreated discharge. The responses also indicate that, on a few occasions, the law enforcers and government officials feel the stories actually complemented their work. This is an aspect they appreciated, since it helped them on follow-ups.

The best aspect for the environmental science writers is on the feedback from the general public. It was established that readers, or simply the general public, appreciated whenever media wrote stories on effluent discharge and even went as far as providing more information to back up the stories. There are those readers who, citing frustration, said they rarely gave feedback to the media, although as indicated already majority said

they appreciated stories on effluent discharge, especially if they were informative and educative. But 12.5% of the respondents were suspicious of the media, as they thought that the media only wrote stories on effluent discharge from industries in order to get bribed and therefore did not take the feedback from readers seriously.

Those residing near industries regard effluent discharge from the industries as a major problem. In times of water scarcity, hygiene is usually wanting, sanitation remain poor and cholera cases start to rise. Some believe that it is a major concern, as the council doesn't maintain the sewers' waste pipes that are at times adjacent to the water pipes. To others, the sewer lines are rusty and keep bursting now and then, posing a major risk to the unsuspecting members of the public. Some respondents felt the problem of effluent discharge from industries is likely to pose even greater challenges in the coming future, especially with the City Council of Nairobi now embarking on sinking boreholes as a way of dealing with the problem of water shortage that has persisted in the city for long. They fear that the effluent discharge might percolate to the ground and pollute borehole water. The other source of concern to the residents is that the number of slum dwellers has been going up daily and this is going to stretch resources, including water, for those staying near industries and thus undermine environmental sanitation.

Majority 87.5% of the respondents interviewed felt that stories on effluent waste did not appear prominently in the papers. Very rarely would stories on effluent waste attain high visibility, like the front page of the mainstream papers, unless a high profile personality is involved. The respondents felt that editors in Kenya have a bias towards political stories and thus often relegate effluent waste stories to the periphery. Others said that they have heard that most of the people involved in the discharge of effluent wastes to the environment are the major advertisers in the mainstream media, hence the media would not want to publish stories against them for fear of losing business.

4.14 Response from Government Policy Makers and NGOs

The major actors in the management of effluent wastes in Nairobi were cited by respondents as Nairobi Water and Sewerage Company (NWSC), City Council of Nairobi (CCN), National Environmental Management Authority (NEMA – Kenya), Ministry of Environment, Ministry of Water and Irrigation and Kenya Bureau of Standards. The main methods for treatment of effluent waste being applied by industries

in Nairobi were highlighted as biological method, Physio-chemical methods, waste stabilization ponds, aeration lagoons, sedimentation tanks and use of wet lands.

4.15 Do Industries Treat Their Waste?

A sizeable number of the respondents said that industries do not treat their wastes before disposing them off. Up to 25 per cent of policy makers and nongovernmental organizations felt industries do not treat their waste, noting that industries just dispose of their effluent into the rivers or the neighborhood. The only highlighted exceptional case by 12.5% of the respondents was Carnivore restaurant that they said treats its waste before discharging to the nearby river. The majority 62.5%, however, said that they did not know at all whether the industries treat their effluent waste.
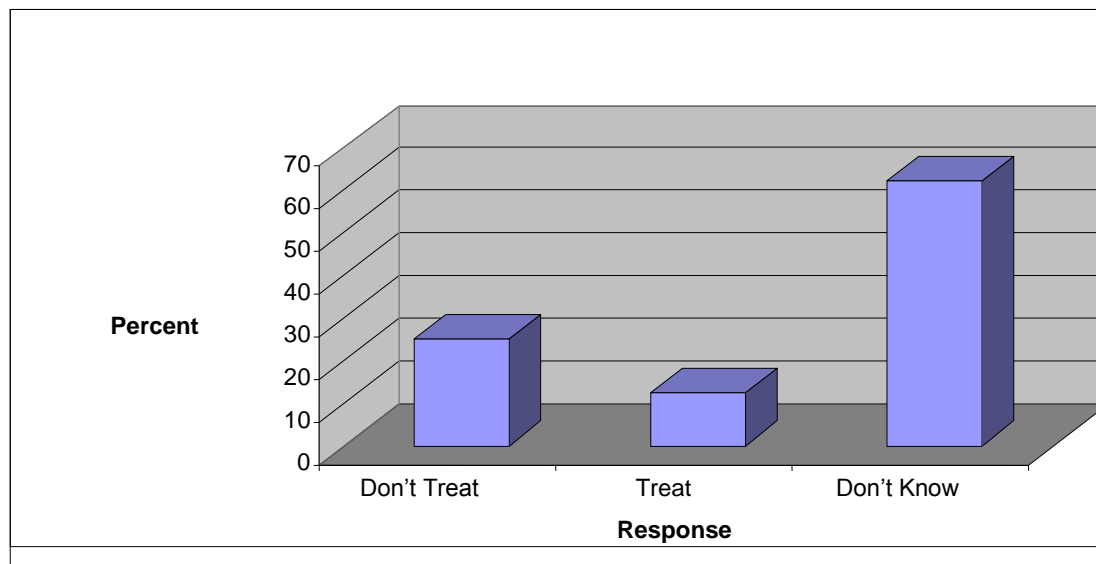
Figure 4.7: Do Industries Treat Their Waste?

Some of the challenges that are encountered when dealing with or managing effluent waste in Nairobi as identified by the study through interviews with respondents included corruption within the regulatory agencies such as NEMA – Kenya, whose staff residents say have been compromised by the polluting industries and therefore lack the capacity to enforce the law. The other challenge from the perspective of the respondents, who included policy makers, was that it was difficult to monitor effluent discharge by industries and hence it is difficult to control the industries.

The other challenge cited by the respondents was Nairobi's overstretched and poorly maintained sewerage system that regularly bursts, blocks and overflows during rainy seasons. The other challenge identified by respondents was the expanding informal settlements around industries in Nairobi, something that has made it difficult to design manageable sewer lines. The last challenge was the issue of poor infrastructure and the lack of skills and technological advancement to treat some types of wastes.

The respondents could not easily provide the daily, monthly and yearly volumes of effluent waste generated in Nairobi, arguing that they were not directly involved in the effluent waste management. The respondents felt that the laws, regulations and policies are not being enforced, something they blame on the oversight authorities, which they say are not keen on enforcing the laws and regulations. Some respondents attributed this to lack of adequate staff, corruption and interference with the work of the oversight bodies by external forces.

Some of the measures suggested by respondents as necessary in order to improve effluent waste management in Nairobi include stronger policy, regulatory and institutional framework; sensitizing the public on effluent waste and its health implications; instituting some changes within NEMA – Kenya, including what the respondents said was the need for a culture change in NEMA; strengthening NEMA – Kenya in terms of work force and capacity to enforce law and, finally, improvement of infrastructure, monitoring and surveillance as well as incorporation of media as a tool for public awareness.

The respondents also cited what they saw as the main contributions of the mass media, however minimal, towards the proper management of effluent waste in Nairobi. These included:

- Sensitization on the problem of effluent waste
- Educating the public on the dangers of poor effluent management
- Constant reporting on the emergent cases of environmental risks
- Highlighting the plight of Kenyans who have to put up with the consequences of mismanagement of effluent waste
- Naming the industries that do not comply with the laws and regulations

4.16 Content Analysis: Daily Nation and East African Standard

This was an assessment of the newspaper content, and the stories that were actually published by the two daily newspapers on industrial discharge were reviewed. This content analysis looked at all the issues of The Daily Nation and The East African Standard published between 2010 (inclusive) and 2014, which has been the period of interest for this study. In this section, we intend to show what the reality is when compared with what the respondents feel. How many stories relating to environment generally did the two newspapers publish within that period, and of this which ones were specifically about effluent discharge and its management? This section also assessed the prominence of the stories on environment and those on effluent discharge.

A simple comparison between the two newspapers found that, out of all the stories on environmental science published during that five year period, 85.93 % were from the Daily Nation while 14.07% cent were from the East African Standard. This was out of a total of 384 stories on environment and effluent discharge published within the period of study. Out of these stories, 330 stories were published in the Daily Nation, with seven of them being on effluent discharge, while only 54 were published in the then East African Standard, with just one occasion on which The East African Standard had a pullout on effluent discharge.

This means that The Daily Nation, boosted with its weekly science pullout, The Horizon, paid more attention to environmental stories than The Standard did between 2000 and 2005. The Daily Nation, with seven stories, also gave more coverage to stories on waste effluent than The Standard did, with just one story, for that period. But when these figures are analyzed more critically, the situation is still bad for both the publications, as the seven stories Nation published for that five year period translates to a paltry 2.12 % stories on effluent discharge out of all the stories published by The Nation on environment related issues. Yet that percentage is still higher than that of The Standard which, with just one story out of the 54 stories on environment published for that period, manages just 1.85 %.

Table 4.5: Total Number of Stories in Each Publication between 2010 and 2014

	The Standard	The Nation	Total
Stories on waste water	1	7	8
Stories on environment	53	323	376
Total	**54**	**330**	**384**

This kind of analysis does not give the full picture, though, as it has so far only looked at the coverage of effluent discharge stories with regard to the general coverage of environmental issues. It does not give an assessment of the proportion of effluent waste stories published by the two newspapers for that five-year period with regard to the space available. This can be put into perspective by taking into account some basic information with regard to the amount of space available for stories for that period during which only seven effluent waste stories were published in The Nation and only one in The Standard.

For that five-year period, The Standard published at least a 32 page newspaper daily, with 16 page pullouts inside, which makes a total of at least 48 pages daily. On a few occasions, this would go to 52 pages or more per day. The Nation on the other hand published anything between 32 to 40 pages of the main newspaper that would come with 16 page magazines daily. This means that The Nation published between 48 pages and 56 pages daily for that five-year period of study. For both newspapers, however, the internal policy as established by this study is for 40 % of the space to be taken up by stories while 60 % to be taken up by advertisements. The newspapers appear to so religiously adhere to these rations that when advertisements fall below the 60 % mark, the pages are reduced to ensure the space occupied by advertisements is 60 %.

The correct assessment here therefore is that, out of the 40 percent of a minimum of 48 pages daily for five years, The Nation could only spare space for seven stories, each less than a page in length, for that entire period. The Standard could only manage it on one occasion, although on that one occasion by The Standard, it spared eight full pages for the subject of effluent waste management in Kenya, with references to the situation

in Nairobi. In terms of prominence, most of the environment stories, much less effluent waste stories, were stashed in the inner pages of the two publications, mostly from pages 16 onwards. None of the stories made it to the front pages of the two publications. Over 90 percent of the headline stories for that period were on politics and politicians.

This is therefore a clear indication that the media did not give priority to environmental coverage as it does to political, sports and business news. The effect this had on the capacity of the media to influence policy and eliciting administrative actions from the relevant authorities was significant. Out of the 384 stories published for that period on environmental related issues, there is none to which the government responded, either by way of press conferences or by way of administrative action that could be linked directly to the published story. The environmental sanitation and health complaints of those residing near industries did not, therefore, attract any public reaction from the key oversight bodies like NEMA – Kenya, the ministry of environment or even the City Council of Nairobi, for the media did not equally give it priority treatment.

4.17 Hypotheses

Table 4.6: Hypothesis one - The mass media is reluctant to cover industrial effluent in Nairobi.

No.	Description	Value	DF	Asymp.sign (2-sided)
1.	Pearson Chi Square	1.633	2	0.111
2.	Likelihood ratio	4.631	2	0.111
3.	Linear by line association	0.684	1	3.45
4.	N of valid cases	90		

A Chi-squared test at 0.05 significance was conducted. The degree of freedom was 2 at $X^2 = 1.633$. The analysis test was (X^2=1.633, DF=2, P=0.111). The probability ratio was 0.111 that is higher than 0.05. Therefore, the null hypothesis was accepted indicating that indeed the mass media was reluctant to cover industrial effluent in Nairobi as per the respondent responses.

Table 4.7: Hypothesis two - Metal pollutants are present in industrial effluents in Nairobi.

No.	Description	Value	DF	Asymp.sign
1.	Pearson Chi Square	1.690	6	0.975
2.	Likelihood ratio	2.712	6	0.975
3.	N of valid cases	90		

A Chi-squared test at 0.05 significance was conducted. The degree of freedom was 6 at $X^2 =1.690$. The analysis test was ($X^2 = 1.690$, DF =6, P=0.975) that was higher than 0.05 level of significance. Therefore, the null hypothesis was accepted that the metal components were present in rivers resulting from pollution.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1   Summary

This section consists of a summary of the findings of the study, in which the key areas of the study are highlighted. The study was on the patterns and contributions of mass media coverage towards the management of effluent waste in Nairobi, with specific objectives that included assessing how effluent waste was managed in Nairobi, the patterns of media coverage as well as the relationship between policy shifts and law enforcement with the nature and patterns of media coverage. The study relied on both primary and secondary data, with most of the secondary data coming from a wide range of sources including journals, brochures, newsletters, newspaper reports and a number of referenced books among others.

The primary data was collected from a sampled population drawn from the media industry with many of who were editors and reporters within Nairobi. A sample of one hundred and thirty nine reporters was drawn from this population. The data was also collected from those residing near industries as well as government officials and civil society organizations. The intention was to also collect data from managers of the industries, the main emitters of effluent discharge to the environment. None of the managers was willing to either grant one on one interview or fill the questionnaires.

A number of methods ranging from brief questionnaires, interviews and observations were used in the study to generate both qualitative and quantitative data. The data was analyzed quantitatively using Statistical Package for Social Sciences (SPSS) version 11 (student version) and presented in form of tables, charts and graphs and qualitative aspects reported as a discussion which clearly explained the output from the respondents. The study established that there was a high amount of effluent waste emissions by industries in Nairobi. It was further determined that almost all industries in Nairobi did not manage their effluent waste as per the existing legislation and regulations.

The study also assessed the extent of mass media coverage of issues related to effluent waste management and found that mass media gave less coverage to environmental issues in general and waste effluent in particular. The study equally found that there is no unifying national policy framework that would have provided background support

and guidelines to key players. Besides, the existing laws and regulations are not adhered to and that law enforcement agencies have very little capacity and support to carry out their work efficiently and effectively.

5.2   Conclusion

The study found that there is a direct relationship between proper effluent waste management in Nairobi, the consistency of coverage by mass media and policy formulations and responses from administrators within the bodies concerned. Where there has been consistent or regular media coverage, such as the case of Nairobi River, the tendency has been for the authorities concerned to pay more attention to the subject matter and thus a corresponding attempt to initiate measures that would ensure proper effluent management. In the case of Nairobi River, for instance, there has been the involvement of not only the entire government machinery but also of international agencies such as the UNEP, primarily because of the public voicing concerns and the media providing a platform for those concerns. Even though initially the media focus was not on the polluters, the long-term consequence has been that polluting industries and slaughterhouses have had to face public scrutiny.

In the wider mater of effluent discharge from industries in Nairobi City, as opposed to just Nairobi River, the study has found that there has been no consistent pattern of coverage of mass media. A number of reasons have been floated to explain this, including corruption within the media, limited capacity within the media and lack of interest since coverage of the subject does not generate as much revenue as other subjects. The study surprisingly found that the authorities in Nairobi have gone to the extent of setting up centralized effluent waste treatment plants for the industries in the city, yet some of the plants such as the one in Kariobangi are not even operating to capacity due to poor maintenance and also due to disinterest from industries to utilize them maximally.

5.3   Recommendations

This study recommends the following measures in order to ensure improvement in the management of effluent discharge in Nairobi. The study further recommends media coverage of not just environmental issues but specifically the subject of effluent discharge from industries.

First, there is need to strengthen the oversight authorities such as NEMA – Kenya by addressing their internal challenges that inhibit their ability to enforce the laws and regulations. Secondly, there is need for emphasis to be given to the enforcement of the laws and regulations, and also to review the existing ones with the view to determining what the loopholes are and what adjustments are needed for the laws and regulations to be both effective and also to be in tandem with the new constitution that has extensive provisions on the right to a clean and secure environment.

Thirdly, and with regard to media coverage, the study found that there is need to review the training of journalists in order to equip them with the necessary competencies that would enable them to adequately handle specialized areas such as environmental science in general or effluent waste in particular. Media houses will need to work closely with the training institutions in order to bridge the gap between industry needs and what the training institutions are producing.

Fourth, the media houses will need to increase the support given to the environmental journalism desks by ensuring proper staffing of the desks, facilitating the individual journalists and creating space and showing interest to publish stories of this genre like is the case with the media in Europe and the Americas. Fifth, the media houses need to revise its relationships with stakeholders on environment, including the general public, the polluters and the oversight bodies. This will ensure that the media remains independent from such influences as that of the advertisers, in which case the media will not be used to shield polluters from public scrutiny. On the other hand, officers of the oversight bodies should feel comfortable to speak to the media more regularly and high the challenges the sub sector faces, as this will not only help create a mutual understanding between the media and the government officials but will also help educate the public on the challenges of waste effluent from industries.

Sixth, there is need for NEMA – Kenya and other relevant oversight authorities to not only ensure that data about effluent discharge from all the industries in Nairobi, and indeed the whole country, is kept but also to ensure that such data is made easily available to the public in line with the constitutional provisions and also because the information is of public interest.

5.4   Suggestions for Further Research

This study found some information gaps that are clearly fertile areas of study or research in the future, which is something that is highly necessary in order to deal with the challenge of the dearth of information earlier alluded to in this study. The suggested areas of study include: First, upon a detailed review of the existing communication strategies in the sector, there is need to carry out an assessment on the communication needs of the oversight environmental bodies such as NEMA – Kenya in order to diagnose the reason (s) for the minimal media attention to this kind of environmental challenges that otherwise have serious implications for the population.

Secondly, also arising from the findings of this study is the need for researchers to inquire in a more detailed way into the efficacy of the effluent waste treatment technologies being used in the country and, further, inquire into the attitudes of the industry managers about the law and effluent waste treatment. Thirdly, there is need for a more targeted study on the actual chemical composition of the effluent discharge by industries in Nairobi, since some of the respondents talked of wounds being sustained by those who come into contact with this discharge, something that would point at a more corrosive, even toxic, substance.

Fourth, there would be need for a study on what incentives are needed in order to attract the interest of the Kenyan mass media towards covering issues of effluent discharge around the country with greater frequency and also to assess what the actual impact of mass media coverage is to the public and law enforcement bodies. This could be assessed along with the question of whether a specialized environmental science publication would have greater impact than the mass media.

Fifth, it would be necessary to carry out a nationwide study of the country's waste management mechanisms, including the efficacy of the technology being used and how its improvement could impact on management of effluent discharge in the country.

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APPENDIXES

APPENDIX 1

SAMPLE QUESTIONNAIRE FOR MEDIA MANAGERS AND WRITERS

Details of the Interviewee (optional)

Name…………………………………………………………

Title..………………………………………………………..

Address……………………………………………………….

Telephone …………………………………………………………

Date…………………………………………………………….

1.	(a) What do you understand by the term effluent waste?

	(b) Do you think this type of waste is well understood within the media?

	(c) Do you think the media has covered well the question of effluent waste management in Nairobi specifically and the country generally?

2.	(a) What are some of the factors that inhibit the media's coverage of issues of effluent waste management?

	(b) What can be done to improve the coverage?

3.	(a) Does your media house have a specialized environment/science desk?

	(b) What is the staffing level of the desk, qualifications of the writers and facilities accorded to the desk?

	(c) How are the stories selected for publication?

	(d) How are the stories on effluent waste rated alongside other stories -political, crime etc

	(e) What is usually your main source of information for stories on effluent waste?

	(f) How regularly do such stories get published in the papers?

4.   (a) How do the following audiences usually respond to your stories on effluent waste?

    (b) Industries in question…………………………………………………….

    (c) Government officers in charge of law enforcement and policy-making…

    (d) Readers and the general public………………………………………….

5.   Do you regard effluent waste to be an issue of concern in Nairobi?

6.   (a) Do stories on effluent waste regularly make it to sections of prominence and high visibility of the paper like the front page (i) Yes…….. (ii) No………

    (b) Why…………………………………………………………………..

SAMPLE QUESTIONNAIRE FOR THOSE RESIDING NEAR INDUSTRIES

Details of the interviewee (optional)

Name……………………………………………………..

Title…………………………………………………….

Address…………………………………………………..

Telephone………………………………………………..

Date…………………………………………………

1.   Which industries are near your residential area?

2.   Do any of these industries emit effluent wastes nearby?

        (i) Yes……….(Y) No……………..

3.   If (a) in (2) above, then kindly give names of these industries?

4.   What are some of the effects, health or otherwise, of the effluent wastes that you have been able to detect?

5.   (a) Has any of the residents ever complained about effluent waste emissions to the authorities?

        (b) If yes, which authority?

        (c) What was the response of the authority?

        (d) What was the response of the industry in question?

6.   (a) Has the mass media ever highlighted these concerns?

        (b) How did the following groups react to the story in the mass media:

        (i) Management of the industry in question

        (ii) Enforcement authorities

        (iii) Civil society groups

        (iv) Residents of the area

SAMPLE QUESTIONNAIRE FOR MANAGERS OF INDUSTRIES

Details of the Interviewee (optional)

Name…………………………………………………..

Title………………………………………………….

Address……………………………………………

Telephone…………………………………………

Date………………………………………………….

1. (a) What amount of effluent waste does your industry generate:

(i) Per day……………

(ii) Per month…………

(iii) Per year…………..

        (b) What is the total amount of effluent waste generated in

                (i) Nairobi………………

                (ii) Countrywide………..

(c) How much of the effluent waste generated in Nairobi is from industries?

(d) What is the main source of effluents in

(i) Nairobi………………..

(ii) Country........................

2.   (a) What is the general composition of effluent wastes in Nairobi?

       (b) What is the general composition of effluent wastes specifically generated by industries in Nairobi?

3.   (a) What are some of the most common methods of waste treatment applied by industries in Nairobi?

       (b) How do you treat your waste?

(c) Briefly outline the process of effluent waste treatment applied by your industry?

(d) What are the alternative methods you would wish to consider for treatment of effluent wastes?

4.   (a) How do you dispose effluent wastes?

(b) Are there recorded effects of the effluent wastes on the environment?

5.   (a) How do you regard the country's effluent waste management regulations?

(b) How effectively are the regulations enforced?

(c) How regularly do officers from enforcement authorities visit your industry?

(d) What improvements would you like to see in the regulations governing e effluent waste management in the country?

6.   (a) How do you communicate your waste management initiatives to the public?

(b) What contribution do you think the mass media makes towards the management of effluent waste in the country?

(c) Comment on the quantity of coverage by mass media on effluent waste management?

(d) Comment on the frequency and prominence of such coverage?

APPENDIX 4

SAMPLE QUESTIONNAIRE FOR POLICY MAKERS AND NGOS

Details of the interviewee (optional)

Name……………………………………………

Title…………………………………………..

Address……………………………………….

Telephone…………………………………….

Date………………………………………….

1.   List some of the major actors in the management of effluent wastes in Nairobi?

2.   What are some of the main methods for treatment of effluent waste being applied by industries in Nairobi?

3.   Do industries actually necessarily treat the effluent waste before disposal?

4.   What are some of the challenges of effluent waste management in Nairobi?

5.   What is the volume of effluent waste generated in Nairobi?

(i)   Per day……………………

(ii)   Per month …………………

(iii)   Per year…………………….

6.   What is the volume of effluent waste generated in the country per year?

7.   How much of the waste is specifically generated by industries?

8.   Are the rules and policies governing effluent waste disposal adhered to by industries?

10.   What adjustments are necessary to improve effluent waste management in Nairobi?

11.   What would be the contribution of the mass media towards the proper management of effluent waste?

12.   Comment on the following:

(a) Quality of coverage by mass media of the problem of effluent waste management in Nairobi?

(b) Frequency of such coverage?