Implementation of Mitigation Measures Resulting from Environmental Impact Assessment in Selected Industrial Projects in Kampala District

Tumwine Umar
BSc.Ed (MAK)

A Dissertation Submitted to the Graduate School in Partial Fulfillment of the Requirement for the Award of the Degree of Master of Education in Science Education of Makerere University

August 2010

Declaration

I **Tumwine Umar** declare that this dissertation represents my own original work and has never been submitted to any University or other Tertiary Educational Institution in any form for an academic award. The contribution of my supervisor to this dissertation was consistent with normal supervisory practice.

Signature of Candidate……

Name of Candidate…….

Date…….

Approval

This is to certify that this dissertation is submitted for the award of Master of Education in Science Education with my approval as the University Supervisor.

Signature of supervisor……..

Name of supervisor: Joseph Oonyu (PhD)

Date…….

Dedication

This dissertation is dedicated to my wonderful parents, who taught me that the best kind of knowledge to have is that which is learned for its own sake and that even the largest task can be accomplished if it is done one step at a time.

Acknowledgements

Dr. Joseph Oonyu was the ideal supervisor of this dissertation from its formative stages to the final draft. His sage advice, insightful criticisms, and patient encouragement aided the writing of this dissertation in innumerable ways. I owe him an immense debt of gratitude. His humour is also deeply appreciated.

Special thanks go to all my devoted lecturers at the Department of Science and Technical Education (DOSATE) for their steadfast support to this dissertation. Notably Dr. Silas Oluka, Dr. Muhanguzi Hozea, Dr. Busulwa Henry, Dr. Josephine Esaete and Ms. Judith Obitre-Gama, their contribution was greatly needed and deeply appreciated. I also wish to acknowledge the contribution of my fellow graduate students with whom I always consulted and discussed my study topic during its formative stage.

I am also indebted to the following people for their assistance in accessing information on industries in Kampala and obtaining Environmental Impact Statements for the industrial projects selected for my study. Mr. Waiswa Arnold (NEMA), Mr. Oule Habbert (NEMA), Ms. Carol (Britania) and Mr. R.N. Chaudhari (Sameer Agriculture & livestock Ltd).

My Parents, brothers and sisters, thank you for all the unconditional love, guidance, and support that you have always given me and instilling in me the confidence that I am capable of doing anything I put my mind to. Finally, I would be remiss without mentioning my friends: Mr. Basalirwa Asuman, Mr. Owori Peter, Mr. Kakembo Jamil, Mr. Odongo Moses and Ms. Asekenye Aidan whose extreme generosity and moral support will be always remembered.

Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms/Abbreviations

CVI:	Content Validity Index
DEO:	District Environmental Officer
DOSATE:	Department of Science and Technical Education
EIA:	Environmental Impact Assessment
EIS:	Environmental Impact Statement
EMP:	Environmental Management Plan
EMS:	Environmental Management System
FGD:	Focus Group Discussion
GOU:	Government of Uganda
ISO:	International Organization for Standardization
KCC:	Kampala City Council
NEMA:	National Environment Management Authority
NGO:	Non-Government Organization
NWSC:	National Water and Sewerage Corporation
PPP:	Polluter Pays Principle
SPSS:	Statistical Package for Social Scientists
TSS	Total Suspended Solids
UNCED:	United Nations Conference on Sustainable Development
UNEP:	United Nations Environment Programme

Abstract

Environmental Impact Assessment (EIA) was recognized in Uganda as a tool of environment management back in 1995 when the National Environment Statute (now Act Cap 153) was enacted. The Act called for EIA to examine all development activities likely to negatively impact on the environment before they are implemented. However, despite EIA being carried out on most development projects, it is uncommon for developers of projects to use the EIA reports as a basis for environmentally sound implementation of their projects (Ecaat, 2004).

Industrialization in Kampala has increased and though this indicates development opportunities, it has had serious environmental consequences. Uganda's National Water and Sewerage Corporation (NWSC) for example is experiencing rising treatment costs because of increased pollution of Lake Victoria from industrial effluents (Lwasa, 2004). There is therefore need to determine whether the actual implementation of projects subjected to EIA fulfils the predictions and recommendations made in the EIA reports. This study therefore sought to asses the implementation of the EIA recommended mitigation measures and was carried out in selected industries in Kampala District with the specific objectives to:

i. Identify the recommended mitigation measures,
ii. Establish the levels of mitigation measure implementation,
iii. Establish the strategies used to implement mitigation measures,
iv. Identify the challenges faced in implementing mitigation measures.

This study analyzed details of mitigation measure implementation from 10 industries located within Ntinda-Nakawa and Port-Bell industrial areas. Both qualitative and quantitative methods were used to collect data. Mitigation measures were identified through document review of EIA reports, the managers of industries were interviewed, while the workers were given questionnaires and FGDs were carried out among community members. The data collected was descriptively analyzed and the following conclusions made;

i. The recommended mitigation measures only focused on the construction and operation phases, ignoring the project design phase of the projects' life cycle.

ii. The level of mitigation measure implementation was low with only 21-40% of the recommended mitigation measures having been implemented. There was also no significant difference in the levels of implementation between wet and dry industries.

iii. The best strategies for implementation of mitigation measures such as monitoring and audits were not adopted by the developers of the industries. Developers did not have any clear strategies for implementation of mitigation measures.

iv. The biggest challenge to the implementation of mitigation measures are the high financial costs coupled with inadequate resources to enforce the implementation process.

It is recommended that, mitigation measures for the industrial projects should focus on all the phases of the project life cycle. EIA follow up should also be strengthened as this stage of the EIA process has generally been neglected, yet it is during this stage that mitigation measures are implemented. EIA practitioners should endeavor to include in the EIA reports the cost-benefit analysis of implementing mitigation measures such that developers are aware of the costs involved right from project design before approval by the Authority. Even before approval of the projects, there should be consent by the developers that they will meet the costs of impact mitigation.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

One of the main achievements of the United Nations Conference on Sustainable Development (UNCED) dubbed the Earth Summit in Rio de Janeiro, Brazil in 1992 was the adoption of Agenda 21, a blueprint of environmental principles, policies and actions required to be taken by all countries into the 21st Century. A key supporting instrument of Agenda 21 was the Rio Declaration on the Environment, a set of principles to guide environmental conduct. It was this declaration that brought out the often repeated principles like "Polluter Pays" and "Precautionary principle". Principle 17 of the declaration states inter alia; "*Environmental Impact Assessment (EIA), as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority."*

UNEP (2002) defines EIA as *an examination, analysis and assessment of planed activities with a view to ensuring environmentally sound and sustainable development.* (Christensen et al, 2005). From this definition, EIA is a systematic process to predict and assess the likely environmental impacts from the proposed projects. EIA ensures that implications on the environment from a proposed project are taken into consideration. EIA is thus an anticipatory, participatory environmental management tool. The emphasis of EIA is on prediction and prevention of environmental damage (Glasson *et al*., 1999). The mitigation of environmental impacts is thus a key stage of the EIA process, and lies at its heart (Wood, 2003). For those projects that are likely or will have significant impacts on the environment, mitigation measures are always identified. Mitigation should therefore occur as an integral part of the EIA process (see Figure 1), developing and refining measures to address the

significant impacts identified during the other stages of EIA (Glasson *et al.*, 1999). Canter et al (1991) define mitigation measures as actions designed to avoid or lessen the adverse impacts of a proposed activity on the environment.

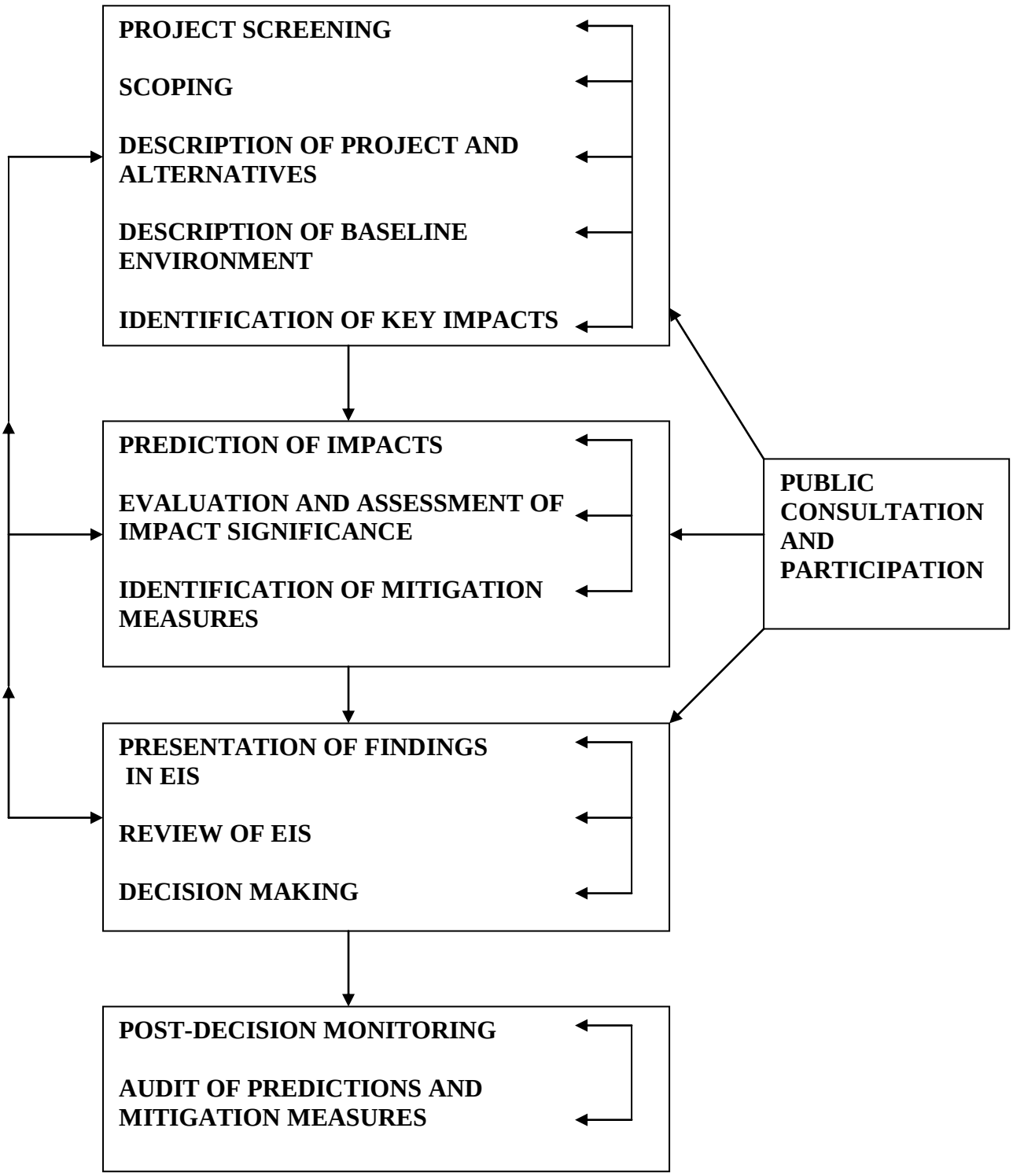


Figure 1: The EIA process (adapted from Glasson *et al.*, 1999).

According to Kennedy (1999) the EIA process without adequate mitigation measures and the subsequent enforcement of their implementation cannot be effective. This typically takes place following impact identification and prediction and recommended measures for mitigation become an important part of the EIA process. The U.S Environmental Protection Agency (1998) further highlights that, mitigation measures are part of the EIA process and lead to practical action to offset the adverse environmental impacts of proposed developmental projects.

Mitchell (1997) highlights the main elements of mitigation in the EIA process as *Avoidance*, *Minimization* and *Compensation*. Avoidance aims at avoiding the adverse impacts as far as possible by use of preventive measures or by not carrying out the proposed action. Minimization aims at reducing adverse impacts by scaling down the magnitude of a project, or employing technology that reduces the factors generating the undesirable environmental impacts, while compensation aims at remedying unavoidable residual adverse impacts. Compensation is the least desirable approach and should only be considered after the other elements have been completed (see Figure 2 for Mitchell's mitigation hierarchy)

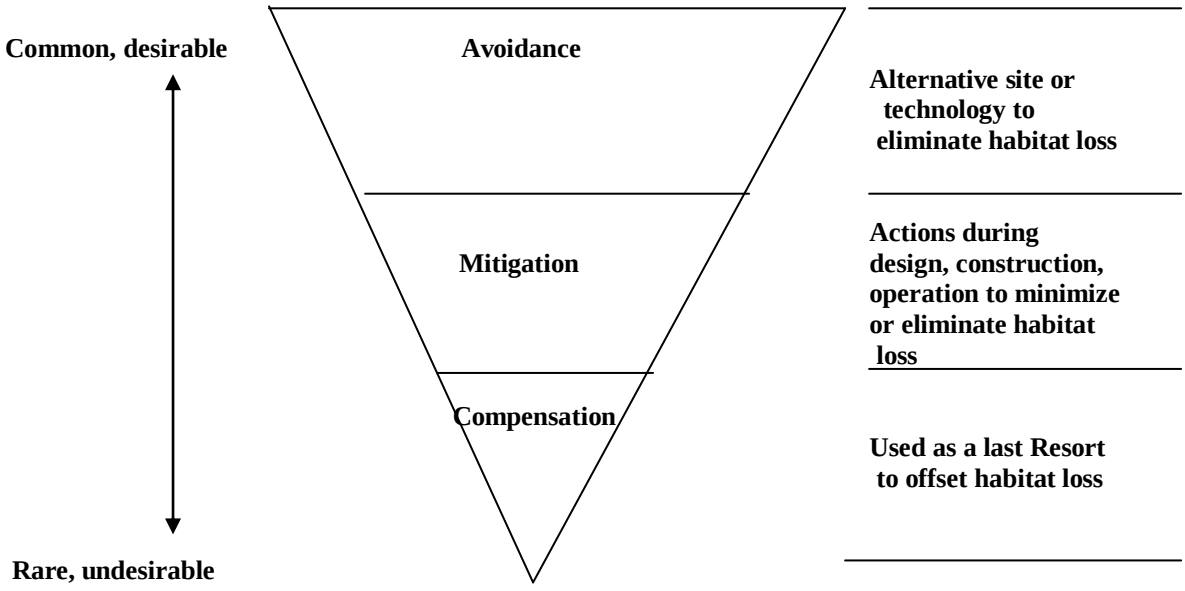


Figure 2: Mitchell's Mitigation Hierarchy (Adopted from UNEP 2002)

EIA was first introduced in the U.S. in 1969 and has since been adopted in many countries worldwide (Wood, 2003). It has become one of the fastest growing environmental management instruments. In many countries, EIA implementation has become mandatory in order to receive the necessary permit for implementation of any development project that is likely to have adverse effects on the environment

In Uganda, EIA was recognized as a tool of environment management back in 1995 when the National Environment Statute (now Act Cap 153) was enacted. It called for Environmental Impact Assessment (EIA) for all development activities likely to negatively impact on the environment before they are implemented. One of the principle provisions of the Act is the requirement that EIA should be administered by communities likely to be impacted upon by the development activities. The National Environment Management Authority (NEMA) was also created and mandated to operationalise and implement the EIA requirement. In order to operationalise this requirement therefore, there was a critical need for NEMA to develop EIA capacity among other institutions and among other stakeholders at national, district and local levels if they were to play a meaningful role in EIA as provided for in the law (Ecaat, 2004).

The Constitution of the Republic of Uganda of 1995 also provides among its National Objectives (Objective No. XXVII), that:

> *"Utilization of natural resources shall be managed in such a way as to meet the development and environmental needs of the present and future generations of Uganda, particularly taking all measures to prevent or minimize damage and destruction to land, air, water resources resulting from pollution or any other kind of natural resource degradation".*

The coming into force of the legal and institutional framework of the EIA process in Uganda therefore increased awareness on EIA. According to Ecaat (2004), awareness on EIA prior to

1995 was low and the status of institutional development for EIA was characterized by limited local EIA expertise, lack of specific responsibility for EIA among developers, sectoral government institutions and at district and local levels. There was also limited NGO, civil society and public participation, with even no formal institutional framework for EIA review and approval.

Currently in Uganda, a number of steps have been taken to develop institutional EIA capacity among various stakeholders and major achievements have included training of managers of the EIA process at sectoral agencies and local government levels. Public participation is also now very evident and a number of civil society groups have emerged and play an advocacy role for EIA. Since its operationalisation, EIA has played a major role in influencing some major development decisions. It has made a contribution to decision making and has in many instances led to avoidance of costly impacts on the environment and natural resources. Such decisions have been considered as positive decisions towards protection and conservation of environmental resources. An example of such important decisions include the decision taken by NEMA in 1997 based on EIA, not to allow use of herbicides for control of Water hyacinth in Uganda's water bodies due to its likely environmental consequences.

According to Ecaat (2004), there is also an increasing demand by local communities and other interest groups for evidence of EIA having been carried out for new projects in their neighborhoods. Pressure from communities on environmental problems related to poor location of certain forms of development projects has led to planning authorities taking action against developers of such projects whose location and associated environmental problems have been challenged by local communities. Such projects include quarries, new landfills for waste disposal, churches, disco halls and places of entertainment whose implementation has often caused serious social problems and must therefore first undertake EIA, in consultation

with the communities likely to be affected. Citizens now exercise their right to demand for EIA as well as sue against developers whom they feel have not fulfilled the EIA requirement.

However, while it is acknowledged that there has been increased awareness on EIA and in general the Uganda EIA system has influenced some development decisions, there remains the challenge of implementation of EIA mitigation measures. Despite EIA being carried out on most development projects, it is uncommon for developers of projects to use the EIA reports as a basis for environmentally sound implementation of their projects. This problem of not using EIA reports in implementation of development projects has been partly blamed on the fact that most developers have not yet appreciated the real value of EIA as a planning tool. They only carry out EIA to fulfill legal requirements. Some developers only carryout EIA as a last resort and as a last minute attempt to catch up with deadlines for other interests such as securing loans. As a result, they end up ignoring the post-EIA stage of follow-up to implement mitigation measures (Ecaat, 2004)

Generally in Uganda, mitigation of impacts is considered during the EIA process but there is lack of post EIA follow up to implement the recommended mitigation measures. Even the local communities, who demand for EIA to be carried out on development projects, do not follow-up to ensure that the mitigation measures are implemented. Too often, there is little opportunity for changes to be made to previously designed projects. Mitigation is frequently an after-thought, and is always given less emphasis. In many instances, mitigation measures remain on the unread pages of the EIA report (Oda, 1992).

While there is lack of post-EIA follow up to implement mitigation measures, industrialisation has increased in Kampala largely due to the liberal investment policy and other macro-economic policies (Lwasa 2004). The government of Uganda has established an industrial estate in the degazetted forest of Namanve which has turned Kampala into an industrial

capital city. According to Lwasa (2004), the formal industrial areas in Kampala are Ntinda, Nakawa, Luzira-Port Bell, Kawempe, and Namanve. These areas accommodate 93% of Uganda's formal industries. Industries in Kampala range from small to large scale. The small scale industries are involved in metal fabrication, woodworks, wine and soft drinks making. The large scale industries are involved in textile manufacture, steel rolling mills, tiles and brick making, soft drinks and beer bottling, hollow ware and tannery to mention but a few.

Though growth in industrial activity indicates development opportunities, it has had serious environmental consequences including wetland degradation and deposition of solid and toxic wastes into water bodies and drainage channels largely due to lack of EIA follow up to implement the recommended mitigation measures. Uganda's National Water and Sewerage Corporation (NWSC) is experiencing rising treatment costs because of increased pollution of Lake Victoria from industrial effluents (Lwasa, 2004). The effluent has affected ecosystems and the health of people who are directly exposed to pollutants. Solid waste accumulation is also one of the environmental consequences of Kampala's increased industrialisation.

Remedying this situation therefore, requires a thorough analysis of the extent to which mitigation measures are being implemented by developers whose projects have been approved by the authority (NEMA). Both the strategies used by developers of industrial projects to implement mitigation measures and the challenges faced need to be documented to aid the planning and decision-making processes in Uganda's EIA system. Such information could attract the attention of lead agencies and Government departments concerned with environment management in Uganda, to come up with strong enforcement measures for the implementation of mitigation measures. This may in the process improve the effectiveness of the EIA system in Uganda, just like Keneddy (1999) suggested, that the practice and effectiveness of EIA can improve with proper implementation of mitigation measures.

1.2 Statement of the problem

Many industrial projects in Kampala continue to impact negatively on the environment despite being subjected to the EIA process. Of particular importance to water pollution are those so-called 'wet' industries that discharge their wastewater into public sewers or storm water drainage channels, which eventually enter surface water (Matagi 2001). It is not fully known whether or not the recommended EIA mitigation measures are being implemented. There are also persistent reports that little attention has been paid to the implementation of EIA mitigation measures and that in many instances they remain on the unread pages of the EIA reports (Ecaat 2004). Neither are the strategies used, nor the challenges faced by developers of these industrial projects in implementing mitigation measures known. If this trend continues, the environment in Kampala is at a risk of undergoing further degradation with increasing industrialization. There is therefore urgent need for information regarding implementation of mitigation measures to enable environmental managers to protect and conserve the environment sustainably.

1.2 Purpose of the study

The study sought to asses the implementation of mitigation measures identified during the EIA process by developers of industrial projects in Kampala.

1.3.1 Specific objectives of the study

The specific objectives of the study were to:

(i) Identify the recommended EIA mitigation measures for the selected industrial projects.

(ii) Establish the level of implementation of the recommended mitigation measures.

(iii) Identify strategies used in the implementation of mitigation measures.

(iv) Establish challenges to the implementation of mitigation measures.

1.3 Research questions

(i) What are the recommended mitigation measures of the selected industrial projects?

(ii) What is the level of implementation of the recommended mitigation measures?

(iii) Which strategies are being employed for the implementation of mitigation measures?

(iv) What challenges do developers of industrial projects face in implementing mitigation measures?

1.4 Significance of the study

The findings of this study could be of help to the various stakeholders concerned with environmental management in Uganda as follows:

i. NEMA the principal agency in Uganda charged with the responsibility of coordinating, monitoring and supervision of all activities in the field of the environment could use the findings of this study to review the policies regarding implementation of mitigation measures and advise the relevant ministries accordingly. Under the laws of Uganda, developers of projects bear the responsibility of ensuring that all the mitigation measures identified during the EIA process are complied with. However, developers of projects take advantage of weak enforcement capacity by different levels of enforcement to omit some of the critical recommended mitigation measures. NEMA will therefore use the findings of this study to strengthen supervision of industrial projects during the post EIA phase.

ii. Government agencies could use the findings of this study to guide their decision making processes, especially after getting information regarding strategies used and

challenges faced by developers of industrial projects while implementing EIA mitigation measures.

iii. EIA practitioners could use the findings of this study to carry out self-evaluation. The EIA practitioners would get to know through this self-evaluation whether or not the mitigation measures they normally recommend are feasible.

iv. Developers of industrial projects could also benefit from the findings of this study as the challenges they face would have been exposed to the relevant government agencies responsible for environment management, and appropriate remedies might therefore be sought.

v. Kampala city council in particular could use the findings of this study to strengthen supervision of industries, especially as industrial pollution is becoming a big problem in Kampala and Uganda as a whole.

vi. Researchers**:** The findings of this study would provide vital information necessary for scientific research thereby contributing to the existing database in the field of EIA.

1.6 Scope of the study

This study mainly focused on establishing the extent to which developers of industrial projects in Kampala district implement EIA mitigation measures. It was conducted in three industrial areas of Kampala district i.e. Ntinda, Nakawa, and Luzira-Portbell (*see appendix 10 for the map of Kampala showing the location of industrial areas*). This study was done by conducting interviews with managers of the industries; the workers were given questionnaires while community members were subjected to FGDs. The study was limited to identifying the mitigation measures and ascertaining their levels of implementation, the strategies used and the challenges faced in implementing them.

1.7 Limitations/difficulties experienced during the study

There were several limitations of the research methodology used to complete this project.

i. The use of questionnaires is limiting due to the depth of information that can be obtained. Majority of the respondents who consisted of the workers of industrial projects and the community members also had little knowledge about EIA mitigation measures. However, this limitation was reduced by conducting a series of face-to-face interviews in order to gain a more in-depth understanding of the subject.

ii. EIA reports were not readily available for review, because the developers did not have them. The researcher had to go through NEMA to obtain the reports majority of which were not in the library, but in the central store that had many of them and selecting the ones required for the study was never an easy task and a lot of time was consumed on this.

iii. Some developers could not allow the researcher to conduct the study in their premises as a matter of policy. In some industries, only the managers accepted to be interviewed, but never the workers and this limited the number of questionnaires given out. This could probably be due to the fact that majority of them are non-compliant with requirement for implementation of mitigation measures as revealed by the study.

iv. Some industries had shifted premises to other areas, and therefore the researcher had to review the sampling to omit those industries that had either closed or shifted and replacing them with others.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter describes the link between mitigation and the EIA process and the strategies that can be taken in EIA to mitigate impacts. Little literature is available on implementation of mitigation measures and the associated challenges. Available literature is on EIA follow-up as a means of implementing mitigation measures.

2.1 Theoretical review

There are no major theories explaining the implementation process of EIA mitigation measures. However, several scholars have argued that, mitigation measures can be effectively implemented through post-EIA follow up. For example Morrison-Saunders and Arts (2004a) stated that, through activities such as monitoring and auditing, EIA follow-up provides concrete means of implementing mitigation measures. Regarding the responsibility to implement mitigation measures, Sadler et al (2002) stated that impact mitigation is consistent with the Polluter Pays Principle (PPP), which places a responsibility of proponents to "internalize" the full environmental costs of development proposals. The Ugandan EIA process according to EIA regulations (1998) also requires the proponent to define the framework for post EIA monitoring i.e. all proponents whose projects have been subjected to EIA are required to ensure that mitigation measures and actions as approved through the EIA to protect the environment are adopted and implemented.

2.2 Conceptual framework

The conceptual framework below shows the implementation process of EIA mitigation measures. Implementation of mitigation measures which is the dependent variable largely

depends on the mitigation strategies (independent variable) used. However, this will depend on how the developers of the industrial projects deal with the mitigation challenges (intervening variable). If proper mitigation strategies are used and the mitigation challenges are effectively dealt with, then adverse negative impacts on the environment can be reduced, thus resulting into improved environmental integrity.

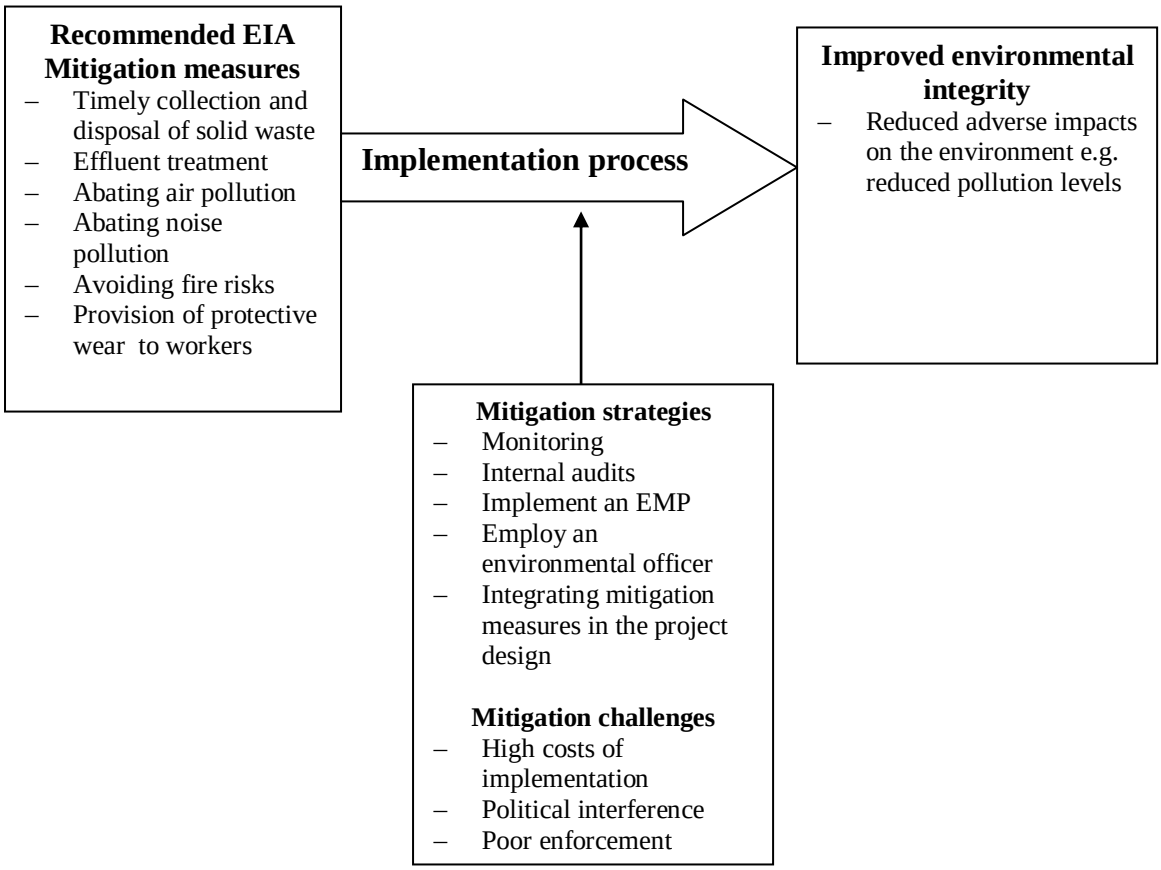


Figure 3: A conceptual model showing the link between the recommended mitigation measures, their implementation and the mitigation strategies and challenges (*Developed by the researcher using principles of EIA implementation*)

2.3 EIA mitigation measures for industrial hazards and wastes

The World Bank (1991) guidelines for environmental assessment of energy and industry projects provide that, industrial facilities have a wide variety of mining, transportation, energy generation, manufacturing and waste disposal operations. As a result, they have

inherent hazards which require careful management. Because of the existence of hazardous materials and wastes, the associated risks need to be adequately managed to minimize adverse impacts.

The World Bank (1991) guidelines therefore provide that, fires, explosions, radiations, emissions of toxic gases and liquids need to be carefully mitigated. The mitigation measures for such hazards include; provision of bunkers or blast walls, provision of fire walls or fire proofing of structures, provision of escape routes for employees, implementation of emergency procedure on-and off-site, provision of public alert systems and education of the public, planning and training for evacuation, provision of safety buffer zones and the plant boundary, lighting in the storage area should be neutral or by permissible lights, to mention but a few.

Droruga (1990) further highlights the possible mitigation measures for other industrial hazards and wastes. Regarding water pollution from discharge of liquid effluents, he advised that a laboratory analysis of liquid effluent should be carried out and it should include metals, TSS, oil and grease, ammonia and pH. A ph level of effluent discharge between 6.0 and 9.0 should be maintained. He explains that, pollutants discharged to air, water and land are potentially harmful to living resources. For example wastewater may contain hydrocarbons, metals, acids, bases, organic compounds and nutrients. If discharged untreated, wastewater can cause eutrophication and water pollution with serious effects on aquatic resources. Even when treated, conventional sewage treatment plants do not remove all the constituents of industrial effluents. In some instances, these constituents may damage the treatment system itself.

UNEP (1997) also provides that, liquid effluent/sewage must be treated to a level that allows it to be discharged without breaching the water quality standards. If the discharges are free of

toxic compounds, sewage sludge can be composted and used as fertilizer. Regarding solid waste, UNEP IE (1997) further states that industrial estates are required to have a solid waste collection system. In some countries, the public sector manages such services which may then be contracted to waste management companies. In others, the services are arranged directly between the generator of the waste and the collector. Waste materials can be separated and collected for reuse, recycling and composting. The World Bank (1991) guidelines further explain that developers of industrial projects should plan for adequate on-site disposal areas assuming screening for hazardous characteristics is known. Referring to air pollution, MacDonald (2001) explains that, as mitigation to air pollution, discharges of fumes should be reduced by applying fumes collection systems.

2.4 Industrial projects and implementation of EIA mitigation measures

Relatively little research has been carried out on this important issue, but there is concern about the effectiveness of EIA without proper implementation of mitigation measures. Little literature is available on implementation of mitigation measures. Available literature is on EIA follow-up which is a means of implementing EIA mitigation measures.

Morrison-Saunders and Arts (2004), provide that EIA follow-up is concerned with events after project approval i.e. are actions actually implemented? The term can be taken to mean 'follow-up to the consent decision' and is used as an umbrella term for various EIA activities, including: monitoring and auditing, ex-post evaluation, post-decision analysis and post-decision management. It has been defined as '*the monitoring and auditing of the impacts of a project or plan (that has been subject to an EIA) for management of, and communication about, the environmental performance of that project or plan*' (Morrison-Saunders and Arts 2004b). Art et al, (2001) (as cited in Siam 2007), stated that EIA follow-up comprises four elements which are outlined in box 1 below;

Box 1: Elements of EIA follow-up

Monitoring: Monitoring compares data that has been collected in the assessment with the standards, predictions and expectations outlined prior to the project's commencement. Post project monitoring takes into consideration compliance to the guidelines set out and the effectiveness of the project. In some cases, multiple projects may be included in the monitoring process in order to compare effects and outcomes from various studies.

Evaluation: Evaluation takes into account the findings of the project in relation to standards, pre-project predictions and expectations. It often includes scientific and technical policies.

Management: Management is the act of responding to the issues which may arise from the monitoring and evaluation processes. The role of management is undertaken by the parties including the proponent and the regulator.

Communication: Communication is the act of informing project stakeholders and the general public about the results from the EIA follow-up. Again the proponent and the regulator may be involved in the communication process.

According to Art et al, 2001 (as cited in Siam 2007), the main function of EIA follow-up is to understand the outcomes of any EIA project. Without the follow-up the outcomes of the project's activities will be unknown. It is a way of gathering information about the impact of the proposed activities and the effectiveness of the project in achieving the goals outlined. One of its most important functions is to create a method of feedback on the EIA activities. It also helps to evaluate the effectiveness of the EIA process and this evaluation may be used to improve EIA projects in the future (Morrison-Saunders and Arts, 2004).

Several reports have indicated that most industries in Uganda do not actually implement the proposed EIA mitigation measures, thus resulting into the increased industrial pollution in Uganda and in particular Kampala (Matagi 2001). Matagi (2001) provides that, Industries in Uganda contribute to pollution by air emissions, noise and wastewater discharge. Inventories carried out from 1990 up to the present show that most industries in Kampala do not have proper methods for disposing of expired chemicals nor chemical wastes (Droruga, 1990; Matagi, 1993; Wasswa 1997)

Little work has been done on industrial emission in Kampala, an indication that EIA mitigation measures are not implemented. However, Nyangababo and Salmeen, 1987 (cited in Matagi 2001) using mosses as bio-indicators found that Sembule Steel Mills located in Nalukolongo industrial area was responsible for air contamination. By comparing samples taken around the mill with background levels an increase in pollutants was found. This is probably attributed to air pollution generated by the steel mill. Wasswa, 1997 (as cited in Matagi 2001) found that sediments in Nakivubo Channel that drains Kisenyi and Katwe area had heavy levels of copper, 17 ppm, chromium, 53 ppm and lead, 91 ppm because of the small artisanal metal fabrication workshops in this area. Wasswa (1997) assessing the impact of anthropogenic activities within the city used guidelines values for classification of Great Lakes sediments GLISP (1986) and concluded that Lake Victoria sediments were heavily polluted with phosphorous and total nitrogen. Lead, zinc, manganese, chromium and copper were found to be at moderate pollution level (Wasswa, 1997).

Of particular importance to water pollution are those so-called ‘wet’ industries that discharge their wastewater into public sewers or storm water drainage channels, which eventually enter surface water (Droruga, 1990; Matagi, 1993, as cited in Matagi 2001). Nakivubo Channel, a storm water drainage channel that passes through the Central Industrial area, has the highest

concentration of the 'Wet' industries. Most of these industries have obsolete technologies, which in most cases are environmentally polluting. For instance no factory has pre-treatment facilities for their wastewater before it is discharged into either the environment or public sewer. Industries in this zone have a combined daily discharge of 5000 m3 of wastewater (Droruga, 1990, cited in Matagi 2001). Unfortunately most of the industrial effluents end up in Murchison Bay of Lake Victoria, which at the same time is the source of water supply for the city.

2.5 Strategies that can be used to implement EIA mitigation measures

Sadler et al (2002) provides that; depending on the timing of the project cycle and the nature of impacts, a number of strategies can be used to achieve the objectives of mitigation. These strategies include; developing environmentally better alternatives to the proposal, making changes to project planning and design, carrying out impact monitoring and management, and compensating for impacts.

Sadler et al (2002) further explain that developing environmentally better alternatives to the proposal is part of a comprehensive approach to mitigation. A broad range of alternatives can be generated at the earliest stages of project planning and design when the process is still flexible. At the later stages of project design, it is more realistic to identify feasible alternatives to the proposal. Making changes to project planning and design is also an important strategy that requires coordination of the engineering, planning and EIA team to address the likely impacts throughout the lifecycle of the project.

Carrying out impact monitoring and management as a strategy to mitigate impacts, should be accompanied by monitoring to check that impacts are as predicted. When unforeseen impacts occur, they require corrective action to keep them within acceptable levels, thereby changing

the mitigation measures recommended in the EIA report. In some cases, it may be necessary to establish or strengthen impact management systems to facilitate the implementation of mitigation measures during project construction and operation. These supporting actions should be identified as part of an environmental management plan.

Stakeholder involvement in the impact mitigation process is a very important strategy according to Morrison-Saunders and Arts (2004). There are three main stakeholders related to the EIA follow-up and impact mitigation. These include the proponents, the regulator and the community. According to Morrison-Saunders and Arts (2004), proponents are the private or government organizations who develop the projects. The basic roles of the proponents are to manage the project and mitigate the impacts realized by the project. The proponent is expected to perform EIA follow-up in most cases. In some regulations, EIA follow-up is required to be done by the proponent. The follow-up carried out by the proponent is called *first parties follow-up*.

Morrison-Saunders and Arts (2004), further highlight the role of proponents that the adverse impacts and consequences of a proposal can occur far beyond the site boundaries of a project. In the past, many of the real costs of development proposals were not accounted for in economic analyses of project feasibility, particularly in the operational and decommissioning phases of the project cycle. As a result, these costs were borne by the community affected or the public at large rather than by the proponent. Stricter requirements are now being imposed on proponents to: mitigate impacts through good project design and environmental management, provide benefits to the community affected by the proposal, prepare plans for managing impacts so these are kept within acceptable levels and make good any residual environmental damage. The responsibility of proponents to 'internalize' the full environmental costs of development proposals is now widely accepted. In addition, many

proponents have found that good design and impact management can result in significant savings.

Further still on the role of proponents, the Ugandan EIA process according to EIA regulations (1998) requires the proponent to define the framework for post EIA monitoring i.e. all proponents whose projects have been subjected to EIA are required to ensure that mitigation measures and actions as approved through the EIA to protect the environment are adopted and implemented. The proponent is further required to conduct self-monitoring, self record keeping and self reporting, and the information gathered through monitoring shall be stored and made available during inspection. The proponent is also required to take all reasonable measures to mitigate any undesirable environmental impacts not contemplated in the Environmental Impact Statement (EIS), and accordingly report on those measures to the Lead Agency and to the Authority.

In addition to proponents, Morrison-Saunders and Arts (2004) further suggest that the Regulator who is a group of the regulation agency is required to ensure that the environment performance by the proponent comply with EIA approval conditions. The major role of the regulation agency is therefore to improve the EIA process in the future and serve as a means for the government agency to keep abreast and control of the project's performance.

The community is another group of stakeholders staying close to the area where the project is being operated. This group of stakeholders may have special knowledge of the local environment, independent to that of the proponent and regulator. They may also be interested in the EIA performance from both stakeholder groups and exert pressure on the proponent and stakeholders to carry out the EIA follow-up. Their involvement may vary from actual involvement in EIA follow-up to simply receiving information from the collected data. The follow-up carried out by this group is called *third parties follow up* (Morrison-Saunders et al,

2003). There are also other organizations that can be part of EIA follow-up such as non government organizations, consultancy agents etc. These groups of people may have special knowledge related to the project, which could help the EIA follow-up to be more effective as a means of ensuring that EIA mitigation measures are implemented.

Sadler et al (2002) suggest another strategy for implementation of mitigation measures as mitigation and Environmental Management Plan (EMP) Mitigation is the practical phase of the EIA process that is concerned with preventing or remedying the adverse impacts and optimizing the environmental and social benefits of a proposal. The aim of mitigation should be to deal first with significant adverse impacts and to realize opportunities for environmental gains and benefits. Once these have been addressed, attention can be turned to impacts that are adverse but not considered to be significant. Some of these may be mitigated easily; others may not. It is not possible to give firm guidance on the extent to which adverse impacts should be mitigated.

Good practice in mitigation requires a relevant technical understanding of the impacts and the measures that work in local circumstances. These aspects will be project-specific and must take account of various issues and considerations, such as practicality, cost-effectiveness, views of stakeholders, and policy and regulatory guidance. Throughout EIA work, early and continuing interaction should take place between the project designers and the EIA team. As soon as significant adverse impacts are identified, the emphasis should be on trying to "design out" through review of alternatives and changes in project design, location or operation. However, certain impacts can be mitigated only by actions taken during the construction and operation of a project.

According to Sadler et al (2002), the mitigation measures identified should be described in an Environment Management Plan (EMP), with details of how they will be implemented for

each impact "targeted". The following information should be included in the EMP, i.e. description of the mitigation action, time/place for implementation, expected results, responsibility for implementation (named individual(s) in operator's organization or in other linked entity), monitoring strategy needed to check on implementation and level of performance success and reporting procedures within operator's organization and to a control authority.

Sadler et al (2002) further provide that impact mitigation is consistent with the Polluter Pays Principle (PPP), which places a responsibility of proponents to "internalize" the full environmental costs of development proposals. Often, this responsibility is interpreted narrowly to mean only compliance with environmental standards and EIA requirements. Under the sustainability agenda, however, this principle may be interpreted broadly, encouraging a proponent to voluntarily meet higher standards of environmental performance, such as compensating for all residual impacts. In this context, mitigation should be seen as an opportunity to realize competitive advantage, as well as a necessary cost of doing business. Good project design and impact management can result in significant cost savings and improved stakeholder relations.

Impact management and monitoring was also identified by Sadler et al (2002) as one other good strategy to use in implementing mitigation measures. Impact management is the process of implementing mitigation measures in accordance with the schedule of actions contained in the EMP, together with any necessary adjustments to respond to unforeseen impacts or other changes. This process, backed by monitoring, encompasses practical steps and actions to control adverse environmental impacts during project implementation (Sadler et al 2002)

Mitigation measures are implemented as part of impact management. This process is accompanied by monitoring to check that impacts are 'as predicted'. When unforeseen

impacts or problems occur, they can require corrective action to keep them within acceptable levels, thereby changing the mitigation measures recommended in an EIA or set out in an environmental management report. In some cases, it may be necessary to establish or strengthen impact management systems to facilitate the implementation of mitigation measures during project construction and operation. These supporting actions should be identified as part of the environmental management plan. They can include the establishment of an Environmental Management System (EMS) based upon ISO 14000 guidelines for strengthening particular arrangements for impact management. Any other supporting actions to implement these measures, such as training and capacity building, should also be specified.

Impact management can occur throughout project construction and continue into the operational and decommissioning phases when, typically, it will become merged into a larger facility-based Environmental Management System. This process may be in operation for a considerable period of time (up to 50 or more years), but with varying emphases and intensity of application and revision. During the initial post-approval stage, impact management forms part of a larger process of EIA follow up. Other follow-up components and tools also support impact management – monitoring in particular provides information that is important for this purpose. As described earlier, the requirements relating to mitigation, impact management, monitoring and other follow-up measures should be described in an environmental management plan (EMP). Once approved, the EMP becomes the basis for impact management, together with any other terms and conditions established by the decision-making body.

A clear agreed plan in writing is essential to guide the impact management work, including coping with unforeseen events or unexpected results. Knowledge of development/ environment interactions is not yet sufficient to ensure that EIA predictions will be accurate

in many cases or at all times. It is important in this context to pay close attention to the prevention or "control" of impacts as they happen. This process of impact management has three main phases: implementation of mitigation measures, monitoring and evaluating the results and revising the EMP when necessary. Lessons from EIA good practice include: implement mitigation measures at the correct time in the correct way and at the correct place, monitor the impacts that are predicted to be potentially significant or particularly uncertain, evaluate the effectiveness of mitigation measures paying particular attention to untried actions or new technology, take immediate action when impacts are higher than forecast and threaten to breach environmental standards, to impair protected or designated areas, etc.; and otherwise, periodically update the EMP using the results from monitoring and evaluation

The EMP, as updated, provides direction to the proponent/operator and a reference point by which the environmental, regulatory or competent authority can oversee the process. Some or all of the following elements need to be in place in order to manage unanticipated impacts: appropriate inspection and enforcement of mitigation and control measures, contingency and emergency plans (e.g. in case of uncontrolled discharge of pollutants), liaison arrangements with the statutory agency for pollution control, line ministry and representatives of local communities, and implementation, when considered necessary of an Environmental Management System (EMS)

Monitoring provides information that is critical to impact management, as well as to making improvements to EIA practice. There are three main types of monitoring which can be undertaken for a project: compliance monitoring (amount/content of waste or effluent streams), mitigation monitoring (whether mitigation actions have been implemented in accordance with an agreed schedule and are working as expected), and impact monitoring (scale and extent of impacts caused by the project)

Usually some form of monitoring will be necessary for large, complex projects, since there will be considerable uncertainty concerning the scale and significance of one or more adverse impacts. Also, monitoring is important for purposes of "risk assurance" where local people may be concerned about the impacts of a project on a local economically important resource for example, a fishery. In such situations, agreement to implement and fund a monitoring programme can be important in reducing public fears and hostility regarding a proposed project, even if EIA work has indicated that no significant impact is likely. Above all, monitoring data functions as an "early-warning" system indicating any trends that are likely to result in an unanticipated and unacceptable impact in the near future, and ideally allowing action to be taken in advance, for example before standards are breached.

Monitoring recommendations need to be carefully formulated. A monitoring programme can be expensive, particularly for ecological impacts. In these circumstances, consultations with interested groups/agencies and, when appropriate, representatives of the public can be helpful to scope and focus monitoring. Important issues to be considered include: identification of impacts to be monitored in priority order, design of an appropriate monitoring programme for each identified impact (this may need additional expert advice, for example from a bio-statistician in relation to ecological or health impacts), likely duration of the individual monitoring programmes, the institutional system by which monitoring data will be collected, collated, analyzed, interpreted and action taken, if necessary, to prevent or reduce unwanted impacts, an action response programme should monitoring results exceed prescribed levels and cost of implementing a recommended monitoring programme

Impact management has been a relatively neglected element of EIA practice. Together with other follow-up measures, increasing attention is now being given to impact management. Also, it is acknowledged that the focus of impact management must incorporate not only

actions to mitigate adverse effects of a project on the surrounding environment, but also measures to compensate fully for residual damage. These may need to take place at locations that, in some cases, are distant from a development site, for example enhancement of another wetland as replacement for on-site losses. However, most attention will focus on management of impacts directly caused by a proposed development, taking the actions necessary to ensure that no unavoidable or unacceptable impacts occur.

Impact monitoring must be a technically sound and scientifically defensible exercise based on periodic repetitive measurements of environmental change that allow comparison between the pre- and post project situation. A common issue in all situations is how to differentiate the change attributable to a project from the variability that characterizes all biophysical or socio-economic systems. In many cases, cause-effect relationships are difficult to separate from the interaction of other factors. Establishing "impact" and "control" monitoring stations is the key to designing and conducting a successful monitoring programme. For example, an impact site would be a water sampling station located downstream from project that will discharge effluent; a control site would be located upstream of the outfall. "With project versus without project" comparisons then can be made for both sites to detect the change or impact that is attributable to the project (Sadler et al, 2002).

Monitoring and impact management are undertaken to protect the environment and the interests of local people. It is increasingly important that these programmes are socially responsive and credible to the public. The results of monitoring, together with any management actions that are initiated, should be reported and address any specific public concerns. It is useful to have a forum whereby the local community is informed of the results of monitoring activities, or interacts more directly with the project operator and the relevant control agencies, for example by jointly reviewing the results of monitoring, identifying any

outstanding issues and agreeing on possible “solutions”. Community liaison arrangements are needed perhaps for only the most controversial proposals, but there should be a consideration on a case-by-case basis of whether such a system is needed.

2.6 Challenges to the implementation of EIA mitigation measures for industrial projects

Ahmad and Sammy (1987) provide that, EIA is a relatively new and growing technology and as a result, problems are constantly being encountered and solutions sought, both for predicting and mitigating impacts. These EIA implementation problems include; too many alternatives, too many impacts, lack of expertise and quantifying impacts. Ahmad and Sammy (1987) argue that, too many alternatives are unmanageable and too large to handle effectively. Large numbers of unmanageable alternatives can be reduced by defining the problem in terms of a series of choices. This will reduce the cost and time of the EIA process while ensuring that all alternatives are considered.

A project may also have hundreds of potential impacts, and there may not be enough money to study them all to provide mitigation. The remedy to this is to optimize the use of available funds by channeling them into a study of the more relevant impacts as against the less relevant. The scoping exercise of the EIA process may also concern itself with the degree of accuracy to which impacts should be quantified. The idea is to avoid the expense of using highly advanced predictive techniques if in fact such degree of accuracy is not essential to the judgmental decision-making process.

In addition to too many alternatives and impacts as provided by Ahmad and Sammy (1987), lack of expertise in many countries particularly the poorest is also a problem to EIA implementation. This is as a result of shortage of trained technologists and experts to do the work of predicting the changes in environmental quality which would result from a

programme or project. It is therefore important that, even where the hiring of foreign expertise is inevitable, the host country should retain management control of the EIA. Too often in the past, an EIA has simply been handed over to a firm of foreign consultants and local input has ceased. This is a dangerous error, especially when impacts on the human environment are involved. A more effective approach is to place the management of the EIA firmly in the hand of a local coordinator, who should make decisions as to what can be done locally and what must be hired from outside.

There are also several cases where impacts cannot be quantified because the theoretical basis for computing the magnitude of an impact does not exist. Thus, there is no available formula or model for calculating the degree to which a proposed action will modify an environmental parameter. Many of these cases pertain to parameters of the human environment such as migration and culture. Questions are always asked whether such impacts should be ignored or addressed in a qualitative form. To Ahmad and Sammy, if an impact has been identified as important during the scoping step, then it should not be ignored simply because its magnitude cannot be quantified. There are several methods which permit the qualitative assessment of an impact based on expert opinions leading to a prediction of its magnitude.

Lee (1987) further provides that inadequately developed means to achieve the mitigation objectives, use of mitigation as a means to access resources and lack of project continuity are among the reasons for lack of success in mitigation implementation. Arts and Nootebloom, 1999 (as cited in Harmer, 2005), also provide that the importance of EIA follow up to implement mitigation measures has been recognized in many countries. However, it has proved difficult to employ follow up in practice for a number of reasons including the use of vague, imprecise and immeasurable terms such as "slight reduction or minor effect", making it difficult to evaluate and verify the accuracy of impact predictions.

Other reasons why follow-up to implement mitigation measures has been difficult in practice have been summarized by Arts and Nootebloom, 1999 (as cited in harmer, 2005), as; Uncertainty and limited information during the pre-decision stages of EIA, deficiencies in Environmental Impact Statements (EISs), lack of guidance on how to conduct follow-up studies, legislation deficiencies, and demands on financial and staff resources.

In light of the literature reviewed, the study sought to determine the extent to which developers of industrial projects in Kampala implement EIA mitigation measures, and specifically to identify the strategies used and the challenges faced.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents a set of methods that were used during the study. It describes the research design, the target and sample population, sampling procedure, research methods and instruments, data collection techniques and the methods of data analysis and management.

3.2 Research design

The study adopted a cross-section survey design to determine the extent to which EIA mitigation measures in selected industries in Kampala have been implemented. This design was selected due to its appropriateness to the nature of study under investigation as the researcher was to deal with the respondents at one point in time. The design involved both qualitative and quantitative methods of research. Questionnaires, interview guides and documentary analysis were the tools of data collection. Focus Group Discussions were also used to gather data from community members around industrial projects. Questionnaires and interview guides were used to gather quantitative data from the workers regarding the strategies used and challenges faced in implementing EIA mitigation measures.

3.3 Sampling technique

As the study is concerned with the implementation of EIA mitigation measures, only industrial projects subjected to the EIA process were considered. This involved simple random sampling of industrial projects from the four major industrial areas of Kampala district.

3.3.1 Population size

According to the database records from NEMA as at 1st October 2008, there are 72 industries that were approved after a thorough EIA process, and these formed the population size for this study.

3.3.2 Sample size

Of the 72 industries, only 21 were located in the four major industrial areas of Kampala district and only 19 were randomly selected to form the desired sample size according to Krejcie and Morgan table for determining sample size. The developers and managers of the industrial projects were purposively selected as key informants owing to their positions and experience. The researcher also purposively selected community members for the focus group discussions.

3.4 Data collection methods

Interviews

The interview method was used both to substantiate the questionnaire findings and to gain a greater understanding of the views of developers and managers of industrial projects with regard to implementation of EIA mitigation measures.

Questionnaires

This method was used to provide quantitative data that supplemented data collected by use of the interview method. For this study, the questionnaire technique was appropriate because it enabled the researcher to collect data from a large number of respondents in the various industrial projects. Questionnaires are a commonly used method for research where a relatively large number of respondents are needed (Goodwin 2004, as cited in Harmer 2005).

Documentary analysis

This method was used to achieve objective one of this study of identifying the recommended EIA mitigation measures for the selected industrial projects. Documentary analysis was used because the recommended mitigation measures could only be identified through the review of EIA reports.

Focus Group Discussions (FGDs)

This was intended to get views of community members around each industrial project. However, the selected industrial projects were far from settlement areas as they are in designated industrial parks. The community members who formed the focus group discussions were mainly motor cycle riders ("Boda bodas") and some women involved in small scale business. The findings of FGDs therefore helped to complement findings from questionnaires and interviews especially on community involvement in the implementation process of EIA mitigation measures. This method was used because of its appropriateness in eliciting information from people of different education levels.

3.5 Data collection instruments

The data collection instruments that were used to collect data include interview guides, questionnaires, observation guides and focus group discussion guides.

Questionnaire guide

This was designed to collect data from workers of industrial projects. The questionnaire was designed in such a way that each question was related to the objectives of the study and they were close ended and open-ended questions. In the close-ended questions, respondents were subjected to questions based on a Likert scale, and they were required to specify their level of agreement to statements regarding implementation of EIA mitigation measures. Likert scale

is the most widely used scale in survey research. There were also questions where respondents were provided with alternative choices from which to select an appropriate answer.

In the open ended questions the respondents were asked to provide their own opinion on what should be done to improve the implementation process of EIA mitigation measures so as to help the researcher get extra information from the respondents. The questionnaire was chosen for this group of people because of their big number, and this enable the researcher to collect a large amount of data from these respondents within a short time. Also, data collected using questionnaires is easy to analyze especially with the use of the computer.

Interview guide

Meanwhile, an unstructured interview guide was used to elicit both short and detailed answers from the developers and managers of industrial projects. The interview guide was used because it is flexible and data got through unstructured interviews usually provide details that are well explained and substantiated. This instrument was deliberately inclined to seek views of developers and managers of industrial projects who were considered to be key informants of this study. The face-face interviews mainly focused on the implementation process of EIA mitigation measures within the industries.

Observation guide

This was used by the researcher in form of a checklist to make physical observations and confirm whether or not certain structural measures such as solid waste collection skips, dumping sites, fire extinguishers and effluent treatment plants were put in place. It was also used to check whether or not employees were provided with protective wear. The checklist also helped the researcher to take note of the noise and air pollution levels in the industries.

This on-site observation helped to check and improve the validity of the findings from interviews and questionnaires.

Focus Group Discussion guide

This consisted of unstructured questions to guide the researcher carry out the FGDs with community members around each industrial project.

3.6 Validity of instruments

In this study, validity of instruments was established by colleagues and supervisor through an assessment of the questionnaire and interview questions to ensure that the instruments cover all aspects of the study under investigation. The questionnaire and interview guide items were rated as either being relevant or not relevant. The questions rated not relevant were omitted from the questionnaire and those rated vague and ambiguous were rephrased. The Content Validity Index (CVI) of the questionnaire and interview items was computed and found to be 0.83 and 0.8 respectively and this is reasonable enough and therefore these tools of data collection were considered valid.

3.7 Reliability of instruments

After establishing the validity of the instruments, a pretest was carried out using 10 respondents whose responses were subjected to a Cronbach Alpha Coefficient reliability test. The instruments were considered reliable since the Cronbach Alpha Coefficient was found to be 0.66 which is above the minimum standard of 0.5.

3.8 Data collection Procedure

The researcher obtained a letter of introduction from the Head Department of Science and Technical Education (DOSATE), School of Education, Makerere University for use in the field. The researcher also sought permission from developers of the industrial projects before

administering questionnaires to selected categories of respondents. Through NEMA, the researcher obtained Environmental Impact Assessment reports for documentary analysis. Appointments were also be made for interviews with the project developers and managers, NEMA and KCC officials. The researcher personally coordinated interviews and administered questionnaires to the respondents to ensure maximum confidentiality.

3.9 Data presentation and analysis

Data was presented using tabulation, graphical methods and analysis of frequencies. Both quantitative and qualitative data was analyzed by descriptive means. The data collected through questionnaires, interview guides was edited, coded and entered into computer. The data fed into computer was then analyzed using the Statistical Programme for Social Scientists (SPSS) version 15.0. The package was used because it has the capacity to accommodate a large number of variables at the same time. Quantitative data presentation involved use of graphs and tables to represent the strategies used and challenges faced during the implementation process of mitigation measures. Qualitative data analysis and presentation, involved a narrative analysis of the data to enrich the study with real and vivid information as given by respondents.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This study investigated the extent to which EIA mitigation measures are implemented by developers and other stakeholders of industrial projects in Kampala district. This was in light of the increasing industrial pollution in Kampala despite the industries being subjected to EIA. Data presentation and analysis was done using descriptive statistics, cross tabulations, frequencies, percentage distributions, and chi-square (tests), which were computed and interpreted. Information in this chapter is presented according to the objectives of the study.

4.2 Background information

The respondents in this study were employees of industrial projects, developers/managers of the projects, plus officials from NEMA and KCC.

Table 1: Background characteristics of workers who filled the questionnaire guides

Characteristic	Category	Frequency	Percentage
Sex	Female	13	24.1
	Male	41	75.9
	Total	**54**	**100.0**
Age group	15-20	2	3.7
	21-30	32	59.3
	31-40	16	29.6
	41 and above	4	7.4
	Total	**54**	**100.0**
Education Level	Certificate	34	63.0
	Diploma	19	35.2
	Degree	1	1.9
	Total	**54**	**100.0**

The background characteristics of the employees in the various industries are given in Table 1 above. Majority of the respondents were males constituting 75.9% while 24.1% were females. This is probably because most organizations prefer male employees to female ones

due to their ability to do manual work as compared to their female counterparts. Majority of these respondents were in the age group of 21-30 years, constituting to 59.3%, followed by 31-40 age group that consisted of 29.6% of the respondents. There were few respondents who were 40 years of age and above constituting to 7.4%, while the age group 15-20 years had the least number of respondents (3.7%). This could be attributed to the fact that the age group of 21-30years consists of very active members, while in the age group 40 years and above, the members are old and a bit weak. Having very few employees in the age group of 15-20 years indicates that members in this age group are some how young and not responsible enough to take on the energy demanding work in the industries. Table 1 also reveals that, 63.0% of the workers were certificate holders, 35.2% were diploma holders and only 1.9% were degree holders. This means that most of the employees are casual workers doing non professional work, with a few diploma and degree holders doing office work.

Table 2: Background characteristics for developers/ managers of industrial projects

Characteristic	Category	Frequency	Percentage
Sex	Female	3	30
	Male	7	70
	Total	**10**	**100.0**
Age group	20-30	0	0
	31-40	7	70
	41 and above	3	30
	Total	**10**	**100.0**
Position of Responsibility	Administrative Officer	2	20
	Quality Control Manager	5	50
	Production Manager	2	20
	Maintenance Officer	1	10
	Total	**10**	**100.0**

There were more male respondents (70%) interviewed than females (30%), among the managers of industrial projects and majority of them were between 31-40 years of age

constituting 70%. This could be probably because female employees normally receive off-duty leaves such as maternity leaves compared to their male counterparts. There were more quality control managers interviewed constituting 50% of the total number of respondents interviewed. Administrative officers only constituted 20%, Production managers also were 20% and the maintenance officers were only 10% of the total number of respondents interviewed. This is because the quality control managers were directly responsible for quality assurance in the industries including compliance to environmental standards, and were thus the right people to provide the required information for this study.

Table 3: Background information for the industrial projects

Category of industries	**Type**	**Frequency**	**Percentage**
Wet Industries	Food processing industries	1	20
	Mineral water bottling industries	2	40
	Diary industries	1	20
	Meat industries	1	20
	Total	**5**	**100**
Dry Industries	Plastic recycling Industries	3	60
	Foam mattress industries	1	20
	Paper/corrugated carton industries	1	20
	Total	**5**	**100**

The industrial projects used in this study were both wet and dry industries. Wet industries consisted of 20% food processing industries, 40% mineral water bottling industries, and diary and meat industries each constituting 20%. The dry industries consisted of plastic recycling industries (20%), foam mattress industries (10%) and paper/corrugated carton industries (10%). The details of the industries are as shown in Table 4 below;

Table 4: Nature and location of the sampled industrial projects

Category of industries	Identification Label	Name of industry	Nature of industry	Location
Wet Industries	A	Britania Allied Industries (U) Ltd	Food processing industry i.e. Juice, biscuits, mineral water etc	Ntinda industrial Area
	B	Sameer Agriculture and Livestock Ltd	Manufacture of milk products	Central industrial area
	C	Oasis Beverages (U) Ltd	Manufacture of beverages e.g. mineral water	Nakawa-Ntinda industrial area
	D	Uganda Meat Industries	Meat processing industry	Old Portbell
	E	Blue Wave (U) Ltd	Mineral water manufacturing industry	Portbell industrial area
Dry Industries	F	SPA Packaging (U) Ltd	Plastic recycling industry	Nakawa industrial area
	G	Graphic Systems (U) Ltd	Corrugated carton plant	Luzira-Portbell industrial area
	H	Euroflex (U) Ltd	Foam mattress manufacturing industry	Nakawa Industrial area
	I	Rwenzori Plastic Recycling Industry	Plastic recycling industry	Nakawa Industrial area
	J	Omega Plastics (U) Ltd	Plastic recycling industry	Nakawa-Ntinda industrial area

Table 4 above reveals that wet industries consisted of the foods and beverages processing industries, while dry industries consisted of plastic recycling, foam mattress manufacturing and paper industries. These industries were located in the major industrial areas of Nakawa, Ntinda, and Luzira-Portbell.

4.3 Major EIA mitigation measures that were recommended

The recommended EIA mitigation measures were identified through document review of EIA reports. During this document review, all the mitigation measures proposed in the Environmental Impact Statements (EISs) for both wet and dry industries were recorded using a document review guide. These industrial projects had been reviewed and assessed by certified EIA practitioners during the EIA process and found to have significant impacts on the environment. The following mitigation measures were therefore suggested for impact mitigation and made a condition precedent for implementation of the industrial projects.

4.3.1 Mitigation measures for solid waste and wastewater/effluent management

According to EIA reports that were reviewed, all the industrial projects considered in this study were likely to increase pollution in the industrial parks through poor solid waste disposal and discharge of untreated effluent. These mitigation measures were different for both wet and dry industries as shown in Table 5 below;

Table 5: Mitigation measures for solid waste and wastewater/effluent management in wet and dry industries

Aspect	Recommended Mitigation Measures	
	Wet industries	**Dry industries**
Solid waste generation	**Nature of waste** Solid waste in wet industries was largely non-hazardous and biodegradable and it did not pose immediate or direct harm to human health and environment. It comprised of peelings from fruits and vegetables, food debris in form of rotten fruits and vegetables. However, if left to accumulate, it could pose serious problems especially to human health. **Recommended mitigation measures** • Developers should ensure timely collection and disposal of all solid waste generated in accordance with National Environment (waste management) regulations 1999, i.e. solid waste should not be left to accumulate. • Keep records of solid waste generated • Contract private companies to routinely collect the solid waste or deal directly with KCC	**Nature of waste** Solid waste from the dry industries was non hazardous. Some waste was biodegradable such as paper remains, while the other was non biodegradable such as off-cuts from plastics, plastic pellet spills and remains of mattresses. **Recommended mitigation measures** • Solid waste should not be burnt but instead be disposed off in a skip and should be timely collected and disposed off. • The off-cuts from plastics and plastic pellet spills from the plastic recycling industries should be recycled • Remains of mattresses from the mattress manufacturing industries should be given to people with workshops as raw material for making chairs. • Developers should contract private companies or deal directly with Kampala City Council (KCC) to routinely collect the solid waste.

Wastewater /Effluent discharge	Wet industries were likely to release effluent into the environment according to the EIA reports. This industrial effluent could pollute water sources, thus causing serious damage to drinking water supplies. **Recommended mitigation measures** • Effluent should be treated prior to its release into the environment, or pre-treated before discharge into the National water and Sewerage Corporation (NWSC) sewer. • A wastewater treatment plant should be installed at these industries for the treatment of industrial effluent. • Developers should carry out a detailed monitoring of water quality of the effluent i.e. simple physio-chemical parameters such as dissolved oxygen, pH, temperature and conductivity should be carried out regularly.	EIA reports revealed that for the dry industries, no effluent was to be generated. However, these industries could still have some wastewater comprised of floor washings that mainly contain detergents and decontamination solutions and which are non-toxic. **Recommended mitigation measures** • Developers should ensure that adequate sanitary facilities such as septic tanks and soak pits are constructed to handle sanitary waste • Developers should construct proper drainage channels to handle storm water.

4.3.3 Mitigation measures for noise pollution

The mitigation measures for noise pollution were the same for both wet and dry industries as per the EIA reports reviewed for the sampled industries. It was revealed that noise pollution was unlikely to affect settlements as the industries are located in designated industrial parks and therefore far removed from such settlements. However, such noise could have adverse effects on the employees of the industries. The following mitigation measures were therefore recommended;

- Any equipment to be installed in these industries should be of acceptable standards to ensure noise levels produced do not significantly affect employees working close or operating such equipment.
- Employees operating such equipment are required to be provided with ear muffs to protect them from excessive noise.
- The exhaust pipes of these machines/equipments and any standby generators should also be fitted with well functioning silencers to reduce noise levels.
- The noise generated must comply with national Environment (Noise Standards and Control) regulations, 2003.

4.3.4 Mitigation measures for air pollution

The EIA reports had little mention on air pollution from both wet and dry industries. It was only anticipated that industries that would install diesel engines/generators due to the erratic power supply in Kampala and such engines would generate fumes that pollute the air. However, the volumes of such gases were not expected to be so much to cause significant adverse effects. It was therefore recommended that, for the industries installing such engines/generators, the exhaust gases be channeled through a pipe of about three metres above the ground surface to allow dispersal.

4.3.5 Mitigation measures relating to health and safety of employees

As mitigation against accidents to employees, a number of measures were recommended for both dry and wet industries. They include;

- Hazardous materials in any industry must be clearly labeled.
- The industries are required to be kept in a clean state, including floor, walls, work rooms, and ceilings.
- Industries should have adequate space to avoid overcrowding and risks of injury to health of persons employed there in. Adequate ventilation should also be provided.
- Extractor fans should be installed in industries to extract dust and other fumes
- Employees/workers should be provided with protective wear such as earmuffs, gloves, gumboots, overall coats, nose masks and head gear.
- Developers are required to provide first aid kits and adequate medical care to the employees in case on an accident.

4.3.6 Mitigation measures for Fire risks

Fire outbreaks were expected in both dry and wet industries which can be economically and environmentally disastrous. It was recommended that;

- To avoid fire accidents, developers should have fire management plans and by not leaving any equipment unattended to.
- Industries should have well functioning fire fighting machines at all times
- Employees should be trained in fire fighting, fire control and first-aid skills.

4.3.7 Other recommendations made in EIA reports

The following recommendations were generally made for both dry and wet industries.

- Developers are required to carry out routine environmental audits as an environmental requirement stipulated in the National Environment Act Cap 153.

- It is a requirement for developers of industrial projects to recruit an environmental officer for the purpose of overseeing environmental issues at the industry.
- Developers are required to institute and implement a comprehensive internal monitoring program. This requires paying special attention to the environmental management and monitoring plan as contained in the EIA reports.
- Developers are also required to ensure proper record keeping as required under section 77 of the National Environment Act Cap153 and their transmission to the Authority as required under section78 of the Act.
- It is the duty of the developer to ensure that any other undesirable environmental impacts that arise due to implementing the project but were not contemplated by the time of undertaking EIA are mitigated in accordance with section 22(3) of the National Environment Act Cap153.
- Environmental awareness should be regularly carried out to sensitize employees about best environmental practices.
- EIA follow up and monitoring to implement mitigation measures was solely the responsibility of the developer, with the help of NEMA and the District Environment Officer (DEO) for Kampala through their compliance and monitoring responsibilities.

4.4 Level of implementation of the recommended mitigation measures

Data about level of implementation of the recommended EIA mitigation measures was collected using questionnaires, interviews and observation checklists. Key aspects were captured in the questionnaire for the workers/employees to asses the level of implementation of EIA mitigation measures.

4.4.1 Views of developers and managers of industrial projects about implementation of EIA mitigation measures

The developers and managers of industrial projects were subjected to a face-to-face interview to elicit in-depth information about the implementation of EIA mitigation measures. There was a unanimous view by all the interviewees that not all the recommended EIA mitigation measures have been implemented. It was revealed during these interviews that some mitigation measures have been implemented especially those with little financial implications on their projects and those that have direct harm to the employees and their projects, while some have not been implemented at all.

The data collected through interviews was supplemented with the findings of the observation checklists and questionnaires. There were differences in the levels of implementation of the mitigation measures by the various industries as shown below;

Table 6: Implementation of mitigation measures regarding solid waste in wet industries

Recommended mitigation measures	Action taken by industries				
	A	**B**	**C**	**D**	**E**
• Developers should ensure timely collection and disposal of all solid waste generated in accordance with National Environment (waste management) regulations 1999.	Solid waste not timely collected and left to accumulate	Solid waste timely collected and disposed of.	Solid waste timely collected and disposed of	Solid waste timely collected and disposed of	Solid waste timely collected and disposed of
• Keep records of solid waste generated	No records kept	No records kept	No records kept	No records kept	No records kept
• Contract private companies to routinely collect the solid waste or deal directly with KCC	Deals directly with KCC	Contracted a private company.	Contracted a private company.	Deals with KCC	Deals with KCC

Table 6 above shows that wet majority of the wet industries had timely collection of their solid waste, though with poor record keeping of the solid waste generated. It is also revealed that majority of the wet industries directly deal with KCC to dispose of solid waste.

Table 7: Implementation of mitigation measures regarding solid waste in dry industries

	Action taken by industries				
	F	**G**	**H**	**I**	**J**
• Solid waste should not be burnt but instead be disposed off in a skip and should be timely collected and disposed of.	Skip provided but solid waste not timely collected and left to accumulate	Skip provided and solid waste timely collected and disposed of	Skip provided and solid waste timely collected and disposed of	Skip provided but solid waste not timely collected and left to accumulate	Skip provided but solid waste not timely collected and left to accumulate
• Recycling and reuse of the solid waste remains e.g. off-cuts from plastics, paper and mattress remains.	Plastic remains recycled	No plastics, but paper remains are reused	No plastics, but remains of mattresses are reused.	Plastic remains recycled	Plastic remains recycled
• Contract private companies to routinely collect the solid waste or deal directly with KCC	Deals directly with KCC	Deals with KCC	Deals with KCC	Deals with KCC	Deals with KCC

Table 7, reveals that all dry industries had secured skips for proper solid waste management. However, majority of the industries do not timely collect the solid waste for disposal. Solid waste was seen to accumulate around the skips, before it could be disposed of. This could be attributed to the fact that in plastic recycling industries, community members are encouraged to take any plastic remains such as empty plastic bottles to the industries for recycling. In the mattress manufacturing industries, it could be due to delays by the business community to pick up the waste for use in chair making.

Table 8: Implementation of mitigation measures regarding wastewater/effluent in wet industries

Recommended mitigation measures	Action taken by industries				
	A	**B**	**C**	**D**	**E**
• Effluent should be treated prior to its release into the environment, or pre-treated before discharge into the National water and Sewerage Corporation (NWSC) sewer.	Effluent not treated	Effluent not treated	No much effluent released. Waste water properly managed with use of septic tanks and soak pits	Effluent not treated	No much effluent released. Waste water properly managed with use of septic tanks and soak pits
• A wastewater treatment plant should be installed at these industries for the treatment of industrial effluent/wastewater.	No wastewater /effluent treatment plant installed.	No wastewater/effluent treatment plant installed	No wastewater/effluent treatment plant installed	No wastewater/effluent treatment plant installed	No wastewater/effluent treatment plant installed
• Developers should carry out a detailed water quality monitoring of the effluent/wastewater	No monitoring carried out	No monitoring carried out	No monitoring carried out	No monitoring carried out	No monitoring carried out

Table 8 reveals that, out of the five wet industries, three had much effluent release because of their nature (food processing industries) while two had less effluent released (mineral water manufacturing industries). None of these industries had an effluent treatment plant and therefore effluent was never treated. There was also no monitoring of the water quality of the effluent.

Table 9: Implementation of mitigation measures regarding wastewater/effluent in dry industries

Recommended mitigation measures	Action taken by industries				
	F	**G**	**H**	**I**	**J**
• Developers should ensure that adequate sanitary facilities such as septic tanks and soak pits are constructed to handle sanitary waste	Septic tanks and soak pits constructed	Septic tanks and soak pits constructed	Septic tanks and soak pits constructed	Septic tanks and soak pits constructed	Septic tanks and soak pits constructed
• Developers should construct proper drainage channels to handle storm water.	Drainage channels constructed	Drainage channels constructed	Drainage channels constructed	Drainage channels constructed	Drainage channels constructed

Table 9 reveals that, all dry industries had put in place adequate sanitary facilities such as septic tanks and soak pits to handle wastewater that mainly consisted of floor washings. Drainage channels had also been constructed by all dry industries to handle storm water. This could be attributed to the fact that such measures are not very expensive to put in place and the likely impacts sanitary waste and storm water could have at industrial sites if not abated.

Table 10: Implementation of mitigation measures regarding noise and air pollution in both dry and wet industries

Recommended mitigation measure	Action taken									
	Wet Industries					Dry Industries				
	A	B	C	D	E	F	G	H	I	J
Noise pollution Equipment should be of acceptable standards to avoid high levels of noise	A lot of noise produced by the boilers	A lot of noise produced by the boilers	Low noise levels	Low noise levels	Low noise levels	Low noise levels	Low noise levels	Low noise levels	Low noise levels	Low noise levels
Well functioning silencers be fitted to the exhaust pipes of the equipment	Silencers not fitted	Silencers not fitted	Silencers not fitted	Silencers not fitted	Silencers not fitted	Silencers not fitted	Silencers not fitted	Silencers not fitted	Silencers not fitted	Silencers not fitted
Provide employees with ear muffs	Ear muffs not provided	Ear muffs not provided	Ear muffs not provided	Ear muffs not provided	Ear muffs not provided	Ear muffs not provided	Ear muffs not provided	Ear muffs not provided	Ear muffs not provided	Ear muffs not provided
Air pollution Exhaust gases from generators/engines and any other machines should be channeled through a pipe to allow dispersal.	No action taken to control air pollution	Air pollution controlled by use of combusto oil	No action taken to control air pollution	No action taken to control air pollution	No action taken to control air pollution	No action taken to control air pollution	No action taken to control air pollution	No action taken to control air pollution	No action taken to control air pollution	No action taken to control air pollution

Table 11: Implementation of mitigation measures regarding health and safety of employees in both dry and wet industries

Recommended mitigation measure	Action taken									
	Wet Industries					Dry Industries				
	A	B	C	D	E	F	G	H	I	J
• Keep industries in a clean state.	Cleanliness maintained	Cleanliness maintained	Cleanliness maintained	Cleanliness maintained	Cleanliness maintained	Cleanliness maintained	Cleanliness maintained	Cleanliness maintained	Cleanliness maintained	Cleanliness maintained
• Industries should have adequate space and ventilation.	Adequate space and ventilation available	Adequate space and ventilation available	Adequate space and ventilation available	Adequate space and ventilation available	Adequate space and ventilation available	Adequate space and ventilation available	Adequate space and ventilation available	Adequate space and ventilation available	Adequate space and ventilation available	Adequate space and ventilation available
• Extractor fans should be installed in industries to extract dust and other fumes	Extractor fans installed	Extractor fans installed	Extractor fans installed	Extractor fans installed	Extractor fans installed	Extractor fans installed	Extractor fans installed	Extractor fans installed	Extractor fans installed	Extractor fans installed
• Employees/workers should be provided with protective wear	Protective wear provided	Protective wear provided	Protective wear provided	Protective wear provided	Protective wear provided	Protective wear provided	Protective wear provided	Protective wear provided	Protective wear provided	Protective wear provided

Table 12: Implementation of mitigation measures regarding fire risks in both dry and wet industries

Recommended mitigation measure	Action taken									
	Wet Industries					Dry Industries				
	A	B	C	D	E	F	G	H	I	J
• Developers should have fire management plans and by not leaving any equipment unattended to.	Fire management plan available	Fire management plan available	Fire management plan available	Fire management plan available	Fire management plan available	Fire management plan available	Fire management plan available	Fire management plan available	Fire management plan available	Fire management plan available
• Industries should have well functioning fire fighting machines at all times	Fire extinguishers installed	Fire extinguishers installed	Fire extinguishers installed	Fire extinguishers installed	Fire extinguishers installed	Fire extinguishers installed	Fire extinguishers installed	Fire extinguishers installed	Fire extinguishers installed	Fire extinguishers installed
• Employees should be trained in fire fighting, fire control and first-aid skills.	Employees trained	Employees trained	Employees trained	Employees trained	Employees trained	Employees trained	Employees trained	Employees trained	Employees trained	Employees trained

Table 13: Implementation of other mitigation measures in both dry and wet industries

Recommended mitigation measure	Action taken									
	Wet Industries					Dry Industries				
	A	B	C	D	E	F	G	H	I	J
• Carry out routine internal environmental audits	No voluntary internal audits carried out	No voluntary internal audits carried out	No voluntary internal audits carried out	No voluntary internal audits carried out	No voluntary internal audits carried out	No voluntary internal audits carried out	No voluntary internal audits carried out	No voluntary internal audits carried out	No voluntary internal audits carried out	No voluntary internal audits carried out
• Each developer should recruit an environmental officer	Officer not recruited	Consultant hired to monitor environmental issues	Officer not recruited	Officer not recruited	Officer not recruited	Officer not recruited	Officer not recruited	Officer not recruited	Officer not recruited	Officer not recruited
• Institute & implement a comprehensive internal monitoring program	No internal monitoring program	Consultant carries out monitoring	No internal monitoring program	No internal monitoring program	No internal monitoring program	No internal monitoring program	No internal monitoring program	No internal monitoring program	No internal monitoring program	No internal monitoring program
• Mitigate unforeseen impacts	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat	Unforeseen impacts not mitigated e.g. heat
• Regularly carry out environmental awareness	No regular awareness	No regular awareness	No regular awareness	No regular awareness	No regular awareness	No regular awareness	No regular awareness	No regular awareness	No regular awareness	No regular awareness
• Record keeping	Poor record keeping	Proper records kept	Poor record keeping	Poor record keeping	Poor record keeping	Poor record keeping	Poor record keeping	Poor record keeping	Poor record keeping	Poor record keeping

Table 10 reveals that mitigation measures for noise and air pollution were generally not implemented as recommended in the EIA reports. Only industry B was able to mitigate air pollution by using combusto oil which if mixed with diesel, it brings about complete combustion thereby reducing emissions into the air. However, all the mitigation measures for health and safety of employees were implemented by both dry and wet industries as shown in Table 11. This is probably because such health risks if not mitigated could have a negative impact on the productivity of employees. Similarly, all the mitigation measures regarding fire outbreaks in industries were fully implemented (see Table 12). This could be attributed to the disastrous effects fire can have on the industries. It is also revealed in Table 13 that, majority of the industries did not implement these other general recommendations. This could be attributed to the high costs involved in their implementation. The frequencies and percentages of industries implementing various mitigation measures are summarized in Table 14 below;

Table 14: Proportion of industries implementing the recommended mitigation measures

NO-	Mitigation measure	Wet industries				Dry industries			
		Number implementing the measure, out of 5.		Number not implementing the measure out of 5.		Number implementing the measure out of 5.		Number not implementing the measure out of 5.	
		f	%	f	%	f	%	f	%
1	Solid waste management	4	80	1	20	2	40	3	60
2	Effluent treatment/waste water management	2	40	3	60	5	100	0	0
3	Noise pollution control.	0	0	5	100	0	0	5	100
4	Air pollution control	1	20	4	80	0	0	5	100
5	Mitigation measures for health and safety of employees	5	100	0	0	5	100	0	0
6	Installation of fire extinguishers and training of employees in fire fighting	5	100	0	0	5	100	0	0
7	Carrying out routine internal environmental audits	0	0	5	100	0	0	5	100
8	Recruiting environmental officers	0	0	5	100	0	0	5	100
9	Having an internal monitoring program	1	20	4	80	0	0	5	100
10	Mitigating unforeseen impacts	0	0	5	100	0	0	5	100
11	Carrying out regular environmental awareness	0	0	5	100	0	0	5	100
12	Keeping proper records	1	20	4	80	0	0	5	100

On average, twelve (12) major mitigation measures were recommended in EIA reports for implementation. These were identified after a thorough review of EIA reports of the industries considered for this study. This document review was supplemented by a series of interviews conducted with project managers and the use of observation checklists.

Table 14 reveals that, majority of the wet industries (80%) have tried to mitigate pollution from solid waste generation. These wet industries mainly consisted of the mineral water bottling industries that did not have a lot of solid waste generated. Therefore, this means that the little solid waste generated was timely collected and disposed off. However, 20% of the wet industries had problems with solid waste management. The solid waste was not timely collected and left to accumulate. This was mainly in the food processing industries probably due to their high rate of solid waste generation.

In contrast, only 40% of the dry industries had properly managed solid waste, while 60% could not collect and dispose of solid waste as required by the law. The solid waste that mainly consisted of off-cuts from plastics, plastic pellet spills and remains of mattresses was left to accumulate before it could be recycled. This could also be because the public kept on bringing more plastic remains to these industries thus adding to the existing hips of solid waste.

Effluent treatment was neglected by the wet industries as there was no industry with an effluent treatment plant. Among the wet industries, only 40% were able to manage waste water. This is probably because they did not have much effluent release as they were only involved in production of mineral water, with waste water from floor washing being channeled to septic tanks as recommended. The other 60% wet industries with much effluent release did not carry out any treatment as recommended, probably due to the high costs involved in effluent treatment.

Air pollution was not given any attention despite the carbon emissions released by these industries into the environment. Of all the industries sampled for this study, it was only Sameer Agriculture and Livestock Ltd (commonly known as Fresh Diary industry), that had an initiative to combat carbon emissions into the environment. The industry was making use

of "Combusto"/Inferno oil which when added to diesel fuel brings about complete combustion of carbon thus reducing carbon emissions to the environment. The rest of the industries had not made any effort to mitigate air pollution. This is attributed to the fact that little mention was made in the EIA reports about air pollution, therefore proponents of industries took advantage of this. Similarly, noise pollution was still a problem as shown in Table 14 above, as none of the industries had implemented the recommended mitigation measures for this environmental hazard. No industry had fitted the noise producing machines with well functioning silencers and the employees operating such machines were not provided with ear muffs/plugs as recommended.

Surprisingly, all industries irrespective of whether wet or dry, had effectively implemented the recommended mitigation measures for fire risks and accidents/health hazards to their employees. This therefore means that proponents of the industries are much aware that fire outbreaks can be economically and environmentally disastrous to their businesses.

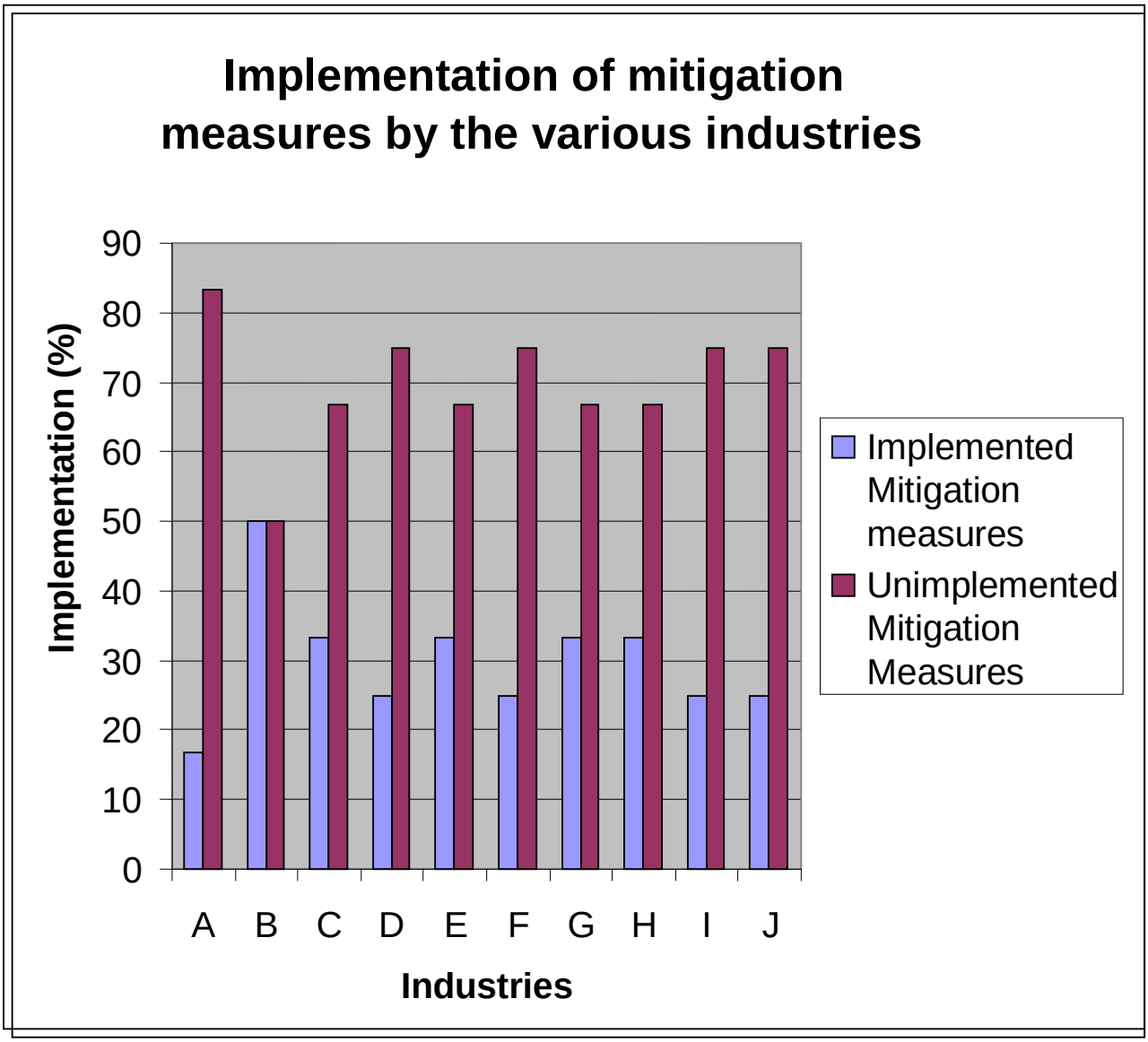
Majority of the recommended mitigation measures have not been implemented. For example mitigation measures for noise pollution, unforeseen impacts, environmental awareness, internal monitoring, routine audits, proper record keeping and employing environmental officers had all not been implemented. However, this varied from one industry to another. Table 15 below gives a summary of the number and percentage of mitigation measures implemented per industry.

Table 15: Number of mitigation measures implemented per industry

	Industry	Number of mitigation measures implemented out of the 12 recommended in EIA reports		Number of mitigation measures <u>not</u> implemented out of the 12 recommended in EIA reports	
		f	**%**	**f**	**%**
Wet Industries	**A**	2	16.7	10	83.3
	B	6	50.0	6	50.0
	C	4	33.3	8	66.7
	D	3	25.0	9	75.0
	E	4	33.3	8	66.7
	Mean	**3.8**	**31.7**	**8.2**	**68.3**
Dry Industries	**F**	3	25.0	9	75.0
	G	4	33.3	8	66.7
	H	4	33.3	8	66.7
	I	3	25.0	9	75.0
	J	3	25.0	9	75.0
	Mean	**3.4**	**28.3**	**8.6**	**71.7**

Table 15, reveals that both wet and dry industries had mitigation measures unimplemented although there were some variations in the level of implementation. As indicated in Table 8, there were more mitigation measures unimplemented than those that were implemented. On average, wet industries implemented 31.7% of the recommended mitigation measures, while dry industries implemented only 28.3%. This means that 68.3% and 71.7% of the recommended mitigation measures were not implemented in wet and dry industries respectively. Implementation of mitigation measures also varied among the various industries as can be graphically shown in Figure 4 below;

Figure 4: Percentage implementation of mitigation measures by the various industries



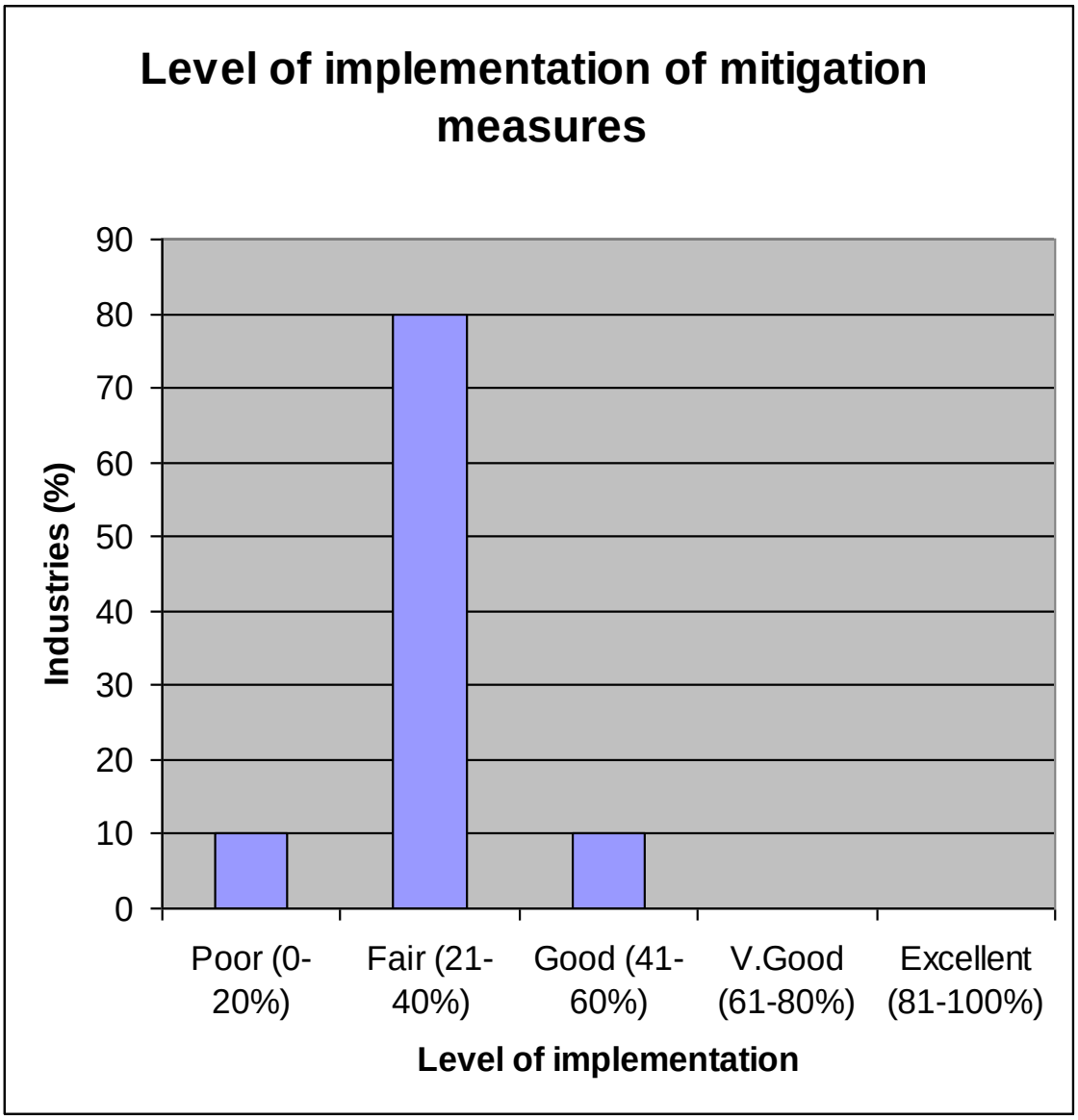
The study reveals as shown in Figure 4 above that, there were more mitigation measures that were not implemented than those implemented. Industrial project A had the least number of implemented mitigation measures and therefore the highest number of mitigation measures that were not implemented. Industrial project B had implemented 50% of the recommended mitigation measures, while the rest of the industries had implemented less than 35% of the recommended mitigation measures. These findings can be subjected to a level of implementation scale as shown in Table 16 below;

Table 16: Level of implementation of mitigation measures

Level of implementation (%)		Number of industries	
%		**f**	**%**
0-20	Poor	1	10
21-40	Fair	8	80
41-60	Good	1	10
61-80	V. Good	0	0
81-100	Excellent	0	0
Total		**10**	**100**

Table 16 shows that, 10% of the industries had poorly implemented the recommended mitigation measures with only less than 20% of the total number of recommended mitigation measures fully implemented. Majority of the industries (80%) had fairly implemented the mitigation measures with at least 20-40% of the total number of the recommended mitigation measures. On the other hand, only 10% of the industries had a good level of implementation of the mitigation measures having implemented 41-60% of the total number of the recommended mitigation measures. None of the industries had a very good and excellent level of implementation. These findings are graphically represented in Figure 2 below;

Figure 5: Level of implementation of the recommended mitigation measures



4.4.2: Responses of employees of industrial projects about implementation of EIA mitigation measures.

The data collected by use of interview guides was supplemented with data from questionnaires. The employees were provided with questionnaires to give their views about the implementation of EIA mitigation measures. The questionnaire items aimed at obtaining the views of the employees of the industries about the implementation of mitigation measures. Their views are summarized in Table 17 below;

Table 17: Employees' responses on implementation of EIA mitigation measures

No-	Statements	Responses											
		Wet industries						Dry industries					
		Agree		Disagree		Not sure		Agree		Disagree		Not sure	
		f	%	F	%	f	%	f	%	f	%	f	%
1	All mitigation measures have been implemented at our factory/industry	6	20.0	19	63.3	5	16.7	6	25	12	50	6	25
2	Some mitigation measures have not been implemented	22	73.3	1	3.3	7	23.3	15	62.5	3	12.5	6	25
3	Air pollution has been reduced at our factory/industry	21	70.0	8	26.7	1	3.3	14	58.3	8	33.3	2	8.3
4	Noise pollution is still a problem at our factory/industry	24	80.0	6	20.0	0	0.0	20	83.3	4	16.7	0	0.0
5	Solid waste management is still a problem at our factory/industry	7	23.3	21	70.0	2	6.7	16	66.7	8	33.3	0	0.0
6	Workers have been provided with protective wear at our factory/industry	15	50.0	15	50.0	0	0.0	19	79.2	5	20.8	0	0.0
7	Fire fighting machines have been installed at our factory/industry	26	86.7	3	10.0	1	3.3	24	100.0	0	0.00	0	0.0

Table 16 above reveals that, majority of the employees in both wet and dry industries had the same view that all mitigation measures in their respective industries had not been implemented i.e. 63.3% of employees in wet industries disagreed with the statement that all mitigation measures had been implemented, while only 20% agreed with the statement and 16.7% were not sure. In contrast, 50% of the employees in dry industries disagreed that all mitigation measures had been implemented, while 25% agreed and 25% were not sure whether or not all the mitigation measures had been implemented. The variation in the level of agreement may be due to their lack of involvement in implementing the mitigation measures. A Chi-Square analysis carried out indicated that there was no significant difference in the levels of implementation of mitigation measures between wet and dry industries (i.e. χ^2 = 1.017; df = 2; p= 0.601)

The employees were also requested through the questionnaire to identify the most common forms of pollution within their industries by rating noise pollution, solid waste, wastewater/effluent and air pollution. The findings are as shown in Figure 3 below;

Figure 6: Most common environmental constraints in Kampala industries

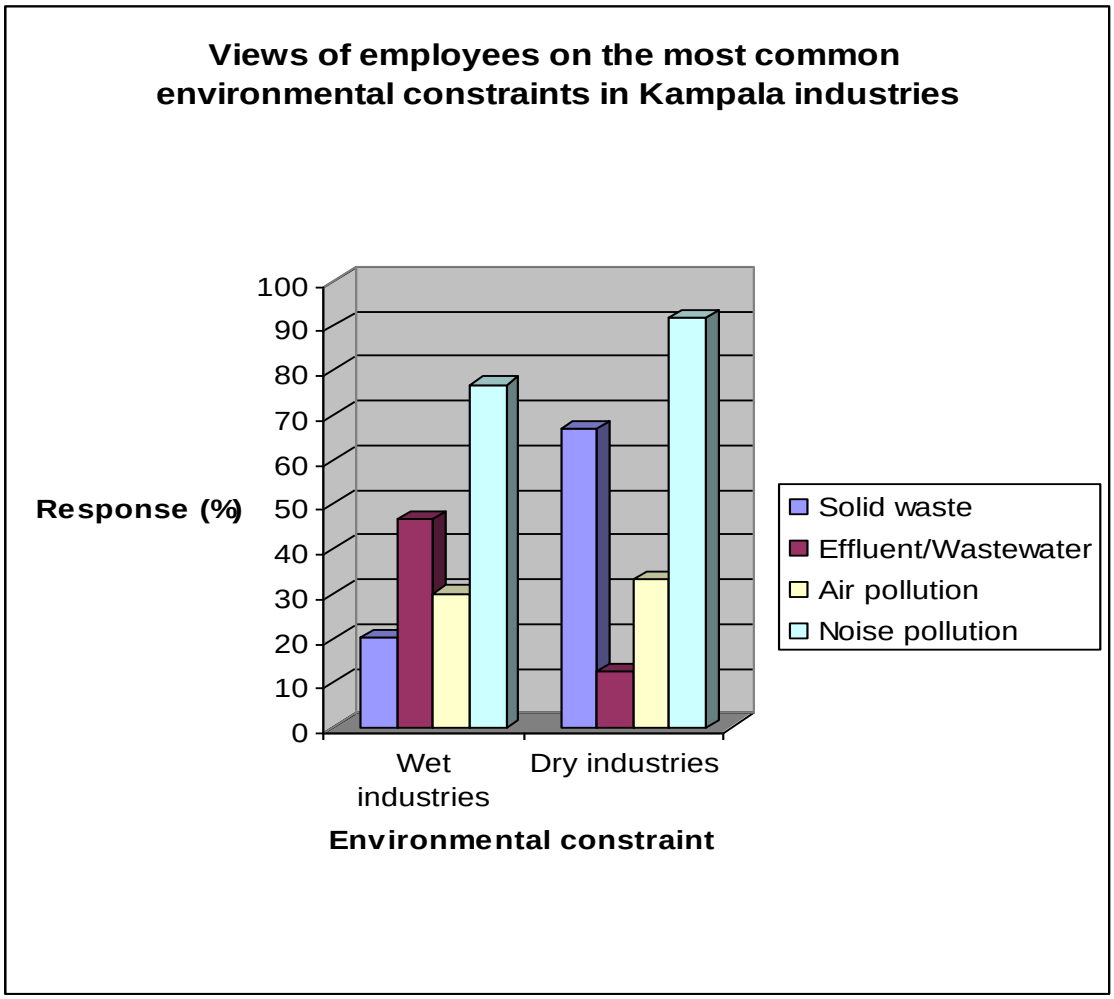


Figure 3 shows that noise pollution was the most common environmental constraint in both wet and dry industries. The second most common environmental constraint in wet industries was industrial effluent/wastewater, while in dry industries it was solid waste. The least common environmental constraint in wet industries was solid waste, while in wet industries, it was wastewater/effluent.

4.5 Strategies used in implementing mitigation measures

A number of strategies were clearly laid out in the EIA reports for the developers of industrial projects to use in implementing mitigation measures. These strategies included the use of Environmental management Plans (EMP), carrying out internal audits, having internal monitoring programs, regular environmental awareness and recruiting environmental officers

to assist in EIA follow up. The study established that, developers and managers of industrial projects had no deliberate policies for applying these strategies to prevent adverse environmental impacts from occurring. This was evident in all the industries irrespective of whether they are wet or dry as indicated in Table 13, that no industry had implemented these mitigation measures that are actually strategies for implementing mitigation measures. Environmental Management Plans (EMPs) had not been fully implemented. NEMA's Environmental Audits and Monitoring Officer through an interview, also conquered with the managers of industrial projects that majority of these strategies are not actually implemented to prevent industrial pollution. This lack of using proper strategies in implementing mitigation measures was attributed to the associated costs involved in their implementation.

However, the employees of the industrial projects had mixed views about the strategies used to implement the mitigation measures to avoid industrial pollution as summarized in Table 18 below;

Table 18: Employees responses on strategies used to implement EIA mitigation measures

No	Statements	Responses											
		Wet industries						Dry industries					
		Agree		Disagree		Not sure		Agree		Disagree		Not sure	
		f	%	f	%	f	%	f	%	F	%	f	%
8	As an employee, am always involved in the implementation process of EIA mitigation measures	26	86.7	4	13.3	0	0.0	6	25.0	16	66.7	2	8.3
9	An environmental officer has been employed at our factory/industry to follow up the implementation of EIA mitigation measures	15	50	10	33.3	5	16.7	18	75.0	6	25.0	0	0.0
10	There is an environmental monitoring plan at our factory/industry to ensure that the environment is not negatively affected	18	60	7	23.3	5	16.7	5	20.8	9	37.5	10	41.7
11	The management at our factory/industry normally carries out environmental audits/inspections	20	66.7	8	26.7	2	6.7	5	20.8	14	58.3	5	20.8
12	NEMA regularly carries out environmental audits/inspections at our factory/industry.	10	33.3	11	36.7	9	30.0	8	33.3	1	4.2	15	62.5
13	Community members are always consulted and involved in implementing EIA mitigation measures	5	16.7	13	43.3	12	40.0	2	8.3	20	83.3	2	8.3
14	Environmental awareness is regularly carried out among all employees at our factory/industry	14	46.7	11	36.7	5	16.7	8	33.3	15	62.5	1	4.2
15	As an employee, am not aware of the recommended EIA mitigation measures	22	73.3	8	26.7	0	0.0	22	91.7	1	4.2	1	4.2

Table 18 presents views of the employees of industrial projects about the strategies used to implement EIA mitigation measures within their industries. Majority of the employees (86.7%) in wet industries agree that they are involved in implementation of mitigation measures. In contrast, majority of the employees (66.7%) in dry industries disagree with the statement that they are involved in the implementation of mitigation measures. This is probably because wet industries release more wastes and therefore employees are involved in their management. However, whether or not they are involved in implementing mitigation measures, majority of the employees in both wet and dry industries agree that they are not aware of the recommended mitigation measures. That is, 73.3% of the employees in wet industries and 91.7% of employees in dry industries agree that they are not aware of the recommended mitigation measures. This means that managers of the industries do not involve all the stakeholders in implementing mitigation measures.

Majority of employees in wet industries agreed that there was an internal monitoring plan (60%) and internal environmental audits (66.7%). In contrast, 37.5% of the employees in the dry industries disagreed with the statement that there was an internal monitoring plan, with majority of the employees (41.7%) being not sure. Majority of employees (58.3%) in the dry industries disagree that there are regular internal environmental audits carried out in the industries.

4.6 Challenges faced in implementing mitigation measures

A number of challenges were revealed by the managers of the industrial projects during the interviews. One of the most outstanding challenge faced in implementing EIA mitigation measures was the fact that implementation is very expensive. All the 10 interviewees emphasized the fact that implementation of mitigation measures is an expensive venture that has no direct monetary returns to their projects. Some of the mitigation measures considered

by the interviewees to be expensive included; installing an effluent treatment plant, employing a full time environmental officer and contracting private companies or KCC to manage solid waste. The other challenges highlighted include; lack of follow up and monitoring, lack of EMPs in some EIA reports, and lack of team work by all stakeholders to implement the mitigation measures.

The Environmental Audits and Monitoring Officer at NEMA highlighted lack of follow up and political influence as the major challenges to the implementation of EIA mitigation measures. Lack of proper EIA follow up was attributed to lack of adequate funds by NEMA to carry out routine audits and monitoring of the industrial projects. Lack of enforcement was greatly affected by political influence.

The employees of the industrial projects through questionnaire items gave their opinions about the challenges regarding implementation of mitigation measures as summarized in Table 19 below;

Table 19: Employees responses on challenges faced while implementing EIA mitigation measures

No-	Statements	Responses											
		Wet industries						Dry industries					
		Agree		Disagree		Not sure		Agree		Disagree		Not sure	
		f	%	f	%	f	%	f	%	f	%	f	%
16	Implementation of EIA mitigation measures has many challenges	24	80.0	1	3.3	5	6.7	19	79.2	5	20.8	0	0.0
17	Implementing all the mitigation measures is very expensive	18	60.0	6	20.0	6	20.0	15	62.5	3	12.5	6	25.0
18	Some mitigation measures have not been implemented because it is costly	13	43.3	9	30.0	8	26.7	10	41.7	2	8.3	12	50.0
19	There is lack of a person with necessary expertise to deal with environmental issues at our factory/industry.	18	60.0	8	26.7	4	13.3	18	75.0	3	12.5	3	12.5
20	The recommended mitigation measures do not address the anticipated negative impacts on the environment	8	26.7	13	43.3	9	30.0	5	20.8	4	16.7	15	62.5
21	Some mitigation measures are not achievable i.e. cannot be implemented	7	23.3	14	46.7	9	30.0	9	37.5	2	8.3	13	54.2

Majority of the employees in both wet (80.0%) and dry industries (79.2%) agree that implementation of mitigation measures is has many challenges. Employees in both wet and dry industries had similar views regarding the cost of implementation, i.e. 60.0% of the employees in wet industries and 62.5% in dry industries agreed that implementation of mitigation measures is expensive. 60.0% of the employees in wet industries and 75.0% in dry industries all agree that lack of a person with the necessary expertise to deal with environmental issues is a big challenge.

In light of the challenges encountered in implementing mitigation measures, the employees through the questionnaires made several recommendations as a way forward for the effective implementation of mitigation measures. These recommendations include;

- Regular internal audits should be carried out by management of industries
- NEMA should strengthen enforcement of mitigation measures, because the developers just intentionally neglect some mitigation measures
- Costs of implementation should be reduced
- Environmental officers should be employed
- All workers should be involved in the implementation of mitigation measures and not leaving the task only the management.
- Community members should be consulted
- Workers should be sensitized to increase awareness

These recommendations are graphically represented in Figure 7 below;

Figure 7: Employees recommendations for effective implementation of mitigation measures

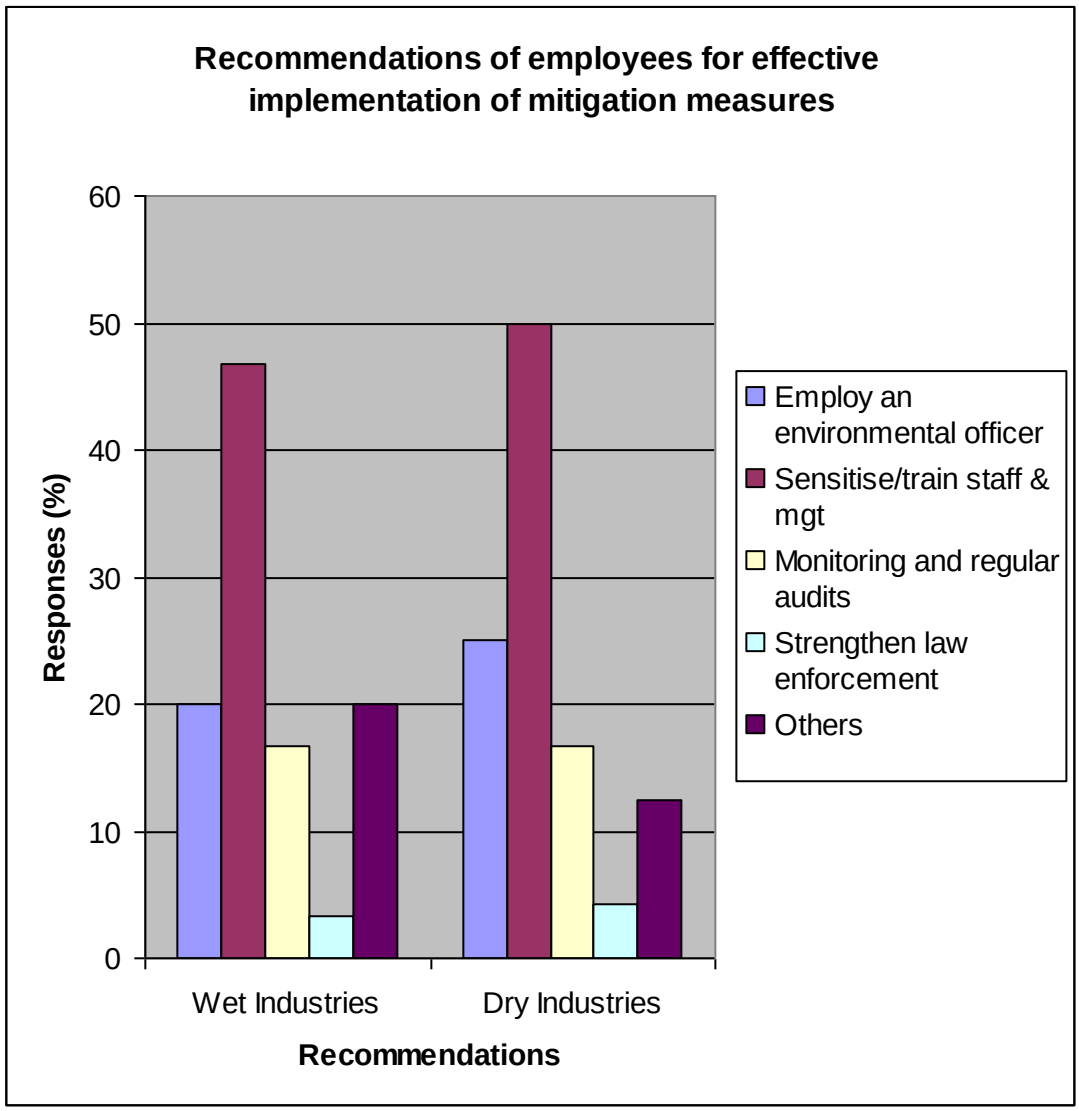


Figure 7 shows that, majority of the employees in both wet and dry industries recommend that sensitization of staff and managers about the importance of implementing mitigation measures should be prioritized. Sensitization and awareness was followed by recruiting environmental officers as a way of ensuring that mitigation measures are implemented through regular monitoring and follow up programs. The least recommended action was law enforcement.

The views of the employees were somehow similar to those of the managers who recommended that;

- Integrated Management Systems be incorporated into environmental management practices
- The government should strengthen law enforcement for EIA follow up
- The government should provide effluent treatment plants in each industrial area and then charge money for treatment from the industries
- Environmental officers should be employed
- Plastic recycling industries should be in touch with those industries that release plastic wastes
- All EIA reports should have EMPs for use by developers
- EIA practitioners should be realistic while proposing mitigation measures, as some of them are not achievable
- NEMA should increase on the number of environmental audits carried out
- NEMA should be friendly to management while carrying out their audits to avoid conflicts
- Employing an environmental officer is expensive, NEMA should therefore endeavour to train workers of industrial projects on how to protect and manage their own environment.

These recommendations were from the employees and their managers indicate that NEMA should increase on its efforts to oversee the implementation of mitigation measures.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study attempted to investigate the implementation of EIA mitigation measures in selected industries in Kampala District. The study sought to identify the recommended EIA mitigation measures, the strategies used to implement them and the challenges faced. This chapter discusses the results and thereafter draws conclusions and recommendations based on the findings of the study.

5.2 Discussion

5.2.1 Major EIA mitigation measures that were recommended

The first objective of the study was to identify the EIA mitigation measures that were recommended by certified EIA practitioners as a condition precedent to implementation of the industrial projects. This was done through a series of document review of the EIA reports obtained from NEMA library as the managers of industrial projects did not have these reports. This therefore meant that the managers did not make use of the EIA reports to implement the recommended mitigation measures. This agrees with ODA, 1992 (as cited in wood, 2003) who stated that; "impact mitigation in developing countries is given less emphasis than in the developed world and, in many instances, mitigation measures remain on the unread pages of the EIA report".

After a thorough review of EIA reports, a number of mitigation measures were identified for both wet and dry industries that were used in this study. The study revealed that, most of the mitigation measures identified in Environmental Impact Statements (EISs) focused on the construction and operation phases of the industrial projects. Mitigation measures for the project design phase were not seen in these EISs. This could therefore mean that EIA for

these projects was carried out when actually the construction phase had started. Ignoring the project design phase is contrary to the views of many scholars. For example Glasson et al (1999) argued that EIA mitigation measures should be formulated according to project phase as this highlights the fact that mitigation is essential for all stages of the development project's life cycle, from design, through construction to decommissioning, restoration and aftercare. This idea is further supported by Sadler et al (2002) who explained that, developing environmentally better alternatives to the proposal is part of a comprehensive approach to mitigation. A broad range of alternatives can be generated at the earliest stages of project planning and design when the process is still flexible. Making changes to project planning and design is also an important strategy that required coordination of the engineering, planning and EIA team to address the likely impacts throughout the project lifecycle (Sadler et al 2002).

While it is preferable to prevent the generation of impacts rather than to reduce or control their effects, it was noted that, most of the recommended mitigation measures did not focus on how to prevent adverse impacts on the environment from occurring. The mitigation measures rather focused on reducing the impacts. It could therefore have been better for the EIA practitioners to put more emphasis on prevention of impacts. This view is supported by Mitchell's (1997) mitigation hierarchy which suggests that, mitigation should be based on the principle that it is preferable to prevent the generation of an impact rather than counteract its effects. In a related view, Glasson et al (1999) also observed that the prevention or reduction of environmental impacts of a development is regarded as one of the major benefits of EIA. Therefore, mitigation which involves taking measures to prevent identified impacts is a very important part of the EIA process.

The study also revealed that, majority of the recommended mitigation measures were similar for both wet and dry industries, thus making it difficult for the researcher to make a clear distinction as to which type of mitigation measures were unique to particular industries. It should have been better to have mitigation measures that are designed specifically for the different categories of industries as they have different levels of pollution. For example the mitigation measures for noise pollution, air pollution and fire risks were the same for both the wet and dry industries. However, there were different levels of pollution among these industries, for example the wet industries especially the food processing industries produce more noise because of the water boiling machines (boilers), compared to the dry industries.

Some mitigation measures were not detailed enough for the project managers to actually use in impact mitigation. For example the mitigation measures for solid waste lacked sustainable waste management measures such as waste recycling. Waste recycling was only recommended for plastic recycling industries that were required to recycle plastic remains. It could have been better for the developers of the industries to know some of the best practices for solid waste recycling such as sorting of waste according to waste type such that some waste type could be reused or recycled. This can greatly reduce the quantities of waste to be generated and dumped at KCC's land fill sites.

Much as the mitigation measures emphasized that the developers of the industrial projects should ensure timely collection and disposal of all solid wastes generated in accordance with National Environment (Waste Management) Regulations 1999, the developers were not aware of such regulations. It was therefore assumed that the developers would themselves look for copies of these waste management regulations. It would have been better for the mitigation measures to have detailed sections of the regulations regarding waste management, for developers to use. And besides having these regulations in place, it is not a guarantee that

the developers would use them in meeting the standards of industrial waste management. This practice of developers not using environmental management regulations conquers with the views of Morrison-Saunders *et al* (2003) who stated that having regulations and the necessary legislation in place does not necessarily guarantee that follow-up to implement mitigation measures occurs in practice.

Mitigation measures for noise pollution were also not detailed enough to provide developers with proper information on how to abate industrial noise. Since the mitigation measures did not thoroughly look at the project design phase, the developers were not advised enough on the industrial equipment to be installed with reference to their levels of noise release. The mitigation measures identified in the EIA reports for noise pollution recommended that equipment to be installed in the industries should be of acceptable standards to ensure noise levels produced do not significantly affect employees. However the acceptable standards were not defined and made available to the developers of industries, who seem to have installed the equipment without following any standards, and hence the high levels of noise pollution in the industries.

While some mitigation measures were not detailed enough, mitigation measures for health and safety of employees, and mitigation measures for fire risks were comprehensively discussed by EIA practitioners. This is probably attributed to the fact that these are sensitive issues that not only have direct harm to humans, but can also be economically and environmentally disastrous.

5.2.2 Levels of implementation of the recommended mitigation measures

The study revealed that there was no significant difference in the levels of implementation of EIA mitigation measures between wet and dry industries. The study also revealed that majority of the mitigation measures had not been implemented in both wet and dry industries.

This finding agrees with Wood (2003) who argued that, mitigation of the impacts of some projects in developing countries is generally considered during the EIA process but is not always implemented. Wood (2003) further explained that, too often, there is little opportunity for changes to be made to previously designed projects and mitigation is frequently an after-thought. This is certainly the case in, for example Egypt (Ahmad and Wood, 2002) and in Tanzania (Mwalyosi and Hughes, 1997). Like the treatment of alternatives, mitigation is given less emphasis and in many instances, mitigation measures remain on the unread pages of the EIA report (ODA, 1992). The fact that majority of the mitigation measures were not implemented may mean that, EIA follow up by NEMA and other stakeholders is poor and therefore implementation largely relies on the goodwill of the developers who are not subjected to stringent checks and controls.

In a related view, Tinker (2003) provided that, many calculations of impact significance are based on the presence of implemented mitigation measures, meaning that failure to ensure such measures are implemented could completely change the impact significance and invalidate the results of the EIA process. Dipper *et al* 1998 (as cited in Harmer, 2005) further explain that, emphasis in EIA has all too often, been on the pre-decision stages and the preparation of the Environmental Impact Statement (EIS), and, that it is used purely as a means of achieving development consent rather than as tool for achieving sound environmental management. This therefore may probably be the reason why majority of the mitigation measures were not implemented.

The mitigation measures that were not implemented include; keeping proper records, carrying out regular environmental awareness, employing environmental officers, having an internal monitoring program, carrying out routine environmental audits, controlling noise pollution and managing unforeseen impacts. Record keeping for example in all industries was poor and

this was envisaged when managers and developers could not locate EIA reports and therefore did not know the recommended mitigation measures. This is contrary to section 77 of the National Environment Act Cap 153 which requires developers to ensure proper record keeping and their transmission to the Authority as required under section 78 of the same Act. Lack of proper records was exacerbated by absence of environmental officers. It could have been the responsibility of the environmental officers to keep all records regarding environmental issues in the industries. Some of the records that are required to be kept in these industries among others include; records of solid waste generated, water quality parameters of the effluent, and all records of regular internal audits and their submission to NEMA.

It was also noted that, carrying out regular environmental audits and having internal monitoring programs were lacking in both wet and dry industries. The EIA regulations, 1998 for Uganda, require all developers of development projects to ensure that all mitigation measures and other actions as approved through the EIA to protect the environment are adopted and implemented. The developer is still required by the same regulations to conduct self-monitoring, self-record keeping and self-reporting and the information gathered through monitoring should be stored and made available during inspection. Despite all these regulations, it is surprising that most of the industries had no proper records and there was no deliberate policy by developers to carry out voluntary self-monitoring.

Mitigation measures for noise pollution were also not implemented, for example noise producing equipment in both wet and dry industries were not fitted with well functioning silencers as required to reduce noise levels. Majority of the employees were not provided with ear muffs or plugs to protect them from excessive noise. However one manager was quoted saying that the employees operating such equipment are provided with all the

protective wear but they do not want to put them on. It is thus not surprising that noise pollution was rated by the employees as the most common form of pollution in both wet and dry industries (See figure 3). Unforeseen impacts were also not given much attention in both wet and dry industries, for example all EIA reports never mentioned about excessive heat production within the industries. This has also gone without any attention by developers of industries as most workers operate under high temperatures within their work rooms, in contrast to the offices of the developers and managers which are air conditioned. For example in the wet industries, the rooms that had boilers were hot and workers were sweating throughout during the time the researcher visited these industries for data collection.

Among the reasons given by project managers for not implementing some mitigation measures was the high financial costs involved in implementing mitigation measures, for example effluent treatment that requires an effluent treatment plant. One manager was quoted saying during an interview that;

> *"An effluent treatment plant is very expensive because it requires a big piece of land for installation i.e. it is like a small lagoon. The equipment required is also very expensive and it requires expertise, meaning therefore that it requires well trained man power to operate it. This makes the process not only expensive, but also long. In fact, in Uganda, it is only Uganda Breweries Ltd that has an effluent treatment plant".*

Because of this, none of the wet industries had installed an effluent treatment plant as recommended in the EIA reports. Industrial effluent is not treated before it is discharged into Lake Victoria through the Nakivubo channel or into NWSC sewer. This finding concurs with Lwasa et al (2004), who stated that; "Uganda's National Water and Sewerage Corporation (NWSC) is experiencing rising treatment costs because of increased pollution of Lake

Victoria from untreated industrial effluents. The effluent has affected ecosystems and the health of people who are directly exposed to pollutants.

It was also noted by almost all the managers interviewed that, besides the high costs of implementing mitigation measures, the Government of Uganda (GOU) further imposes high taxes on their industries. This therefore means that the developers of the industries must look for ways of maximizing profits and reducing costs which can only be achieved by not implementing mitigation measures that have high financial demands on their industries. This finding is supported by Arts and Nootebloom, 1999 (as cited in Harmer, 2005), who stated that among other reasons why EIA follow up to implement mitigation measures has been difficult in practice are the high demands on financial and staff resources. EIA follow-up to implement mitigation measures requires considerable resources in terms of time, money and staffing.

However, some mitigation measures were better implemented in some industries than in others. For example, mitigation measures for solid waste management had been implemented largely well in wet industries compared to the dry industries. That is, 80% of the wet industries had implemented mitigation measures for solid waste management in comparison to only 40% of the dry industries. This could be due to the nature of the solid waste in these industries and rate of accumulation. Wet industries consisted of biodegradable solid waste such as food debris while majority of the dry industries consisted of non-biodegradable solid waste such as plastic remains.

The study has also established that, mitigation measures for some aspects tend to be more comprehensively implemented than others. For example, mitigation measures for health and safety of employees and those for fire risks are particularly well implemented. This is could be probably attributed to the fact that measures for health and safety, and measures for fire

risks if properly implemented can effectively address impacts that have direct harm not only to humans but also to the industries. For example fire out break within an industry can be economically and environmentally disastrous; therefore, this forces developers of industries to effectively implement recommended mitigation measures for such very sensitive aspects.

Nearly all workers were provided with protective wear such as overall coats, gumboots, gloves, nose masks and head covers. This is probably to ensure that accidents to the workers are avoided. However, workers were not provided with ear muffs as recommended to prevent them from being affected by excessive noise levels. This is a great concern given the effect noise pollution has on humans. Fire fighting machines were also installed in all the industries visited and fire control safety measures were put in place as recommended in EIA reports.

In order achieve the overall goals and objectives of EIA systems in Uganda, then mitigation measures should be implemented as part of the post-EIA follow up program. This concurs with Harmer (2005) who stated that, the identification of mitigating measures is part of the pre-decision stage of the EIA process however; these measures are of little or no value unless they are actually implemented.

5.2.3 Strategies used to implement the recommended EIA mitigation measures

Majority of the industries did not have clear strategies for implementing mitigation measures, as they only depended on the recommendations of EIA reports which majority of them were not implemented. Majority of the EIA reports had well prepared Environmental Management Plans (EMPs) for use by the developers in the EIA follow up process to implement mitigation measures. Out of 10 EIA reports reviewed, only three (30%) did not have EMPs i.e. 70% of the EIA reports used in this study had well prepared EMPs. Use of EMPs is one of the best strategies to use by developers in implementing mitigation measures. EMPs are implemented as part of the EIA follow up activities.

In a related view, Hickie and Wade, 1997 (as cited in Harmer 2003) stated that, EMPs form the last section of EISs with details of implementation arrangements and commitments for the mitigation proposed earlier in the EIS. It is surprising however, that none of the developers had EMPs to refer to in implementing the recommended mitigation measures. EMPs may also include monitoring and liaison arrangements, the objectives of the mitigation, and checklists to ensure that mitigation measures are effectively implemented. EMPs can thus play a key role in the implementation of mitigation measures because they provide a link between the project planning phase identification of impacts and mitigation in EISs and the construction and operational phases (World Bank, 1999b)

It was revealed during this study that, some managers had employed use of some Environmental Management Systems (EMSs) such as ISO 14000. For example at Britania Allied Industries Ltd and Sameer Agriculture & Livestock Ltd, the quality control managers were trying to follow the ISO 14000 guidelines as a tool for environmental best practice. This use of EMS is supported by Sadler et al (2002) who argued that it is necessary to establish or strengthen impact management systems to facilitate implementation of mitigation measures during project construction and operation phases. Impact management systems may include establishment of an Environmental Management System (EMS) based upon ISO 14000 guidelines for strengthening particular arrangements for impact management. However majority of developers have not adopted the use of EMS probably because Uganda is not a member of the ISO.

In a related view, George (2000) recommended that an environmental management system, for example ISO 14001, be instigated to avoid negative impacts during the operation of projects. He believed that such a structured approach could place clear responsibilities on the stakeholders involved. However, the costs involved in implementing monitoring practices can

be high, and although development assistance can initially provide funding, national governments will ultimately need to become more actively involved. In situations where inadequate funds are available for a comprehensive monitoring programme, resources should be targeted towards those impacts identified as being most significant (George, 2000).

Use of private environmental consultants to follow up impact mitigation was evidenced in only one industry as a replacement for an environmental officer. The rest of the industries neither had environmental officers nor private environmental consultants. It is thus important for these industries to have people specifically responsible for overseeing environmental issues although this comes at a cost to these industries as earlier discussed.

The study revealed that as a strategy to implement mitigation measures, some industries involved the employees in the implementation process while others did not. For example, in the wet industries, 86.7% of the employees agreed that they were involved in comparison to only 25% of employees in dry industries who were involved in the implementation process. Because of this lack of involvement, 91.7% of the employees in dry industries agreed that they were not aware of the recommended mitigation measures. However, even in wet industries where employees are involved in implementing mitigation measures, majority of them (73.3%) still were not aware of the recommended mitigation measures. This lack of knowledge of the recommended mitigation measures by employees could also be attributed to the fact that even their managers had little knowledge as well since they never had EIA reports at their disposal to refer to.

Community involvement in implementing mitigation measures was also lacking in both wet and dry industries. This was acknowledged by 83.3% of the employees in dry industries who disagreed that community members were involved in implementing mitigation measures (Table 17). Similarly, 43.3% of the employees in wet industries also concurred with their

counterparts in the dry industries that community members are not involved while 40% were not sure. The FGDs carried out with communities indicated that they were not aware of what actually takes place in the industries. Morrison-Saunders et al (2003) provide that, community involvement in EIA follow up to implement mitigation measures is very important as this group of stakeholders may have special knowledge related to the project. This could help EIA follow up to be more effective as a means of ensuring that mitigation measures are implemented. Community involvement may vary from actual involvement in follow up, to simply receiving information from collected data.

Monitoring and follow up were also lacking in both dry and wet industries. The employees had mixed views about monitoring, internal audits and NEMA's involvement in the implementation process of mitigation measures. For example, 66.7% of the employees in wet industries agreed that their managers regularly carry out internal environmental audits, while majority of the employees (58.3%) in dry industries disagreed with this view. However, these audits have not been voluntary according to the Environmental Audits and Monitoring Officer at NEMA. Industries rarely carry out internal audits neither do they have internal monitoring programs. This finding agrees with Wood (2003), who stated that, monitoring has been a missing step in the EIA process in most developing countries. NEMA's Environmental Audits and Monitoring Officer further explained that EIA follow up was generally still a problem due to socio-economic and political constraints.

5.2.4: Challenges faced in implementing EIA mitigation measures

As part of this study, the interviewees were requested to give the challenges encountered while implementing mitigation measures and all the 10 interviewees (100%) cited the high financial costs involved. For example because of the high financial costs involved in implementing mitigation measures, environmental officers were not employed, no routine

environmental audits and no effluent treatment plants are in place. However, these developers/managers were not aware that it is their responsibility to meet the costs of pollution control and prevention from their industries. Sadler et al (2002) explain that, impact mitigation is consistent with the Polluter Pays Principle (PPP), which places a responsibility to proponents to internalize the full environmental costs of development proposals. The full polluter pays principle which is principle 16 of the Rio declaration states that;

> *"National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment".*

The reason as to why majority of the developers and managers of industrial projects complained of high financial costs associated with implementation of mitigation measures, could be probably because EIA practitioners did not include the economic analysis of the mitigation measures in the EIA reports. A standard EIA report should have the cost-benefit analysis of the recommended mitigation measures, such that developers are aware of the costs involved in undertaking their projects before implementation. This is supported by the view that economic analysis is normally conducted as part of the project feasibility study and should contain the following elements that are integrated into the overall economic analysis of the project, i.e. costs and benefits of environmental impacts, costs, benefits and cost-effectiveness of mitigation measures and discussion of impacts that have not been expressed in monetary values and in quantitative terms. (*http://www.adb.org/Documents/ Guidelines/Environmental Assessment/Content Format Evironmental_Assessment.pdf*). It could therefore have been better for EIA reports to have this section of economic analysis to help developers understand that impact mitigation and management is part of the project

lifecycle. All the other challenges encountered such as employing environmental officers, internal audit and monitoring etc centered on the costs involved in their implementation.

Political interference was also highlighted by NEMA's Environmental Audits and Monitoring Officer as one of the challenges to the implementation of mitigation measures. This has also affected the post-EIA follow up process, as this is not done in some industries due to political influence thus undermining the role of NEMA to supervise and oversee all development projects in Uganda.

Lack of adequate resources to implement the enforcement mechanism for the implementation of mitigation measures was also highlighted by NEMA as one of the biggest challenges. NEMA is required by law to effect the supervision of all development projects in Uganda to avoid environmental degradation. However, because of the large number of projects in diverse areas of the country, and given the limited resources necessary to traverse the entire nation so as to maintain EIA standards, sometimes it is very difficult to ensure that the EIA process is followed at all times and all places. In a related view, Hollick (1981), stated that the agencies concerned with the enforcement of EIA follow up and implementation of mitigation measures, must have adequate resources to do the work and incentives to carry it out well. This also concurs with Arts and Nootebloom (1999) who explained that EIA follow-up to implement mitigation measures requires considerable resources in terms of time, money and staffing in both developer and regulatory agencies. Without adequate resources therefore, implementation of mitigation measures may not be possible.

5.3 Conclusions

1. Regarding the identified mitigation measures for both wet and dry industries, it is concluded that the recommended EIA mitigation measures only focused on the construction and operation phases of the development project's life cycle. Mitigation measures for the project design phase were not emphasized by EIA practitioners, yet this is an important stage of the project life cycle that can greatly prevent or avoid adverse impacts on the environment. On the other hand, there was no clear distinction between mitigation measures for wet and dry industries as they all seemed to be similar for most of the environmental impacts.

2. The level of implementation of mitigation measures was fair with at least 80% of both wet and dry industries implementing 21-40% of the total number of recommended mitigation measures. This therefore means that majority of the recommended mitigation measures (60%) have not been implemented. Majority of the mitigation measures implemented are those with less economic implications on the industries, and those whose impacts have direct harm on humans and the industries such as fire risks. There was also no significant difference in the levels of implementation between wet and dry industries, meaning that in both wet and dry industries, implementation levels were low.

3. Developers of industrial projects do not have any clear strategies for the implementation of EIA mitigation measures. The post-EIA phase of the EIA process that mainly consists of follow up during which mitigation measures are implemented has generally not been emphasized. This therefore means that environmental audits and monitoring which are the best strategies for implementation of mitigation measures have not been employed. Employees of industrial projects are not involved in the implementation process of mitigation measures, as nearly all of them, just like their managers did not know the EIA

recommended mitigation measures. The study further concludes that, environmental awareness was never carried out among the employees in both wet industries. More important to note is the fact that all the industries considered for this study had not employed environmental officers as a strategy to ensure effective implementation of mitigation measures.

4. The biggest challenge to the implementation of EIA mitigation measures are the high financial costs involved coupled with inadequate resources to enforce the implementation process. This is the reason why majority of the mitigation measures have not been implemented by developers of industries.

5.4 Recommendations

1. Mitigation measures should focus on all the phases of the project lifecycle i.e. project design, construction and the operation phase. The mitigation measures also need to be detailed enough to avoid negative environmental impacts and they should be specifically designed for different projects i.e. wet and dry industries should have quite different mitigation measures as they have different levels of pollution. It is also recommended that the costs and benefits of impact mitigation be well laid out in the EIA reports for the developers to get an insight of costs involved in implementation of mitigation measures before project implementation. All EIA reports should also have well prepared and detailed EMPs.
2. To improve on the level of implementation of mitigation measures, there is need to emphasize EIA follow up. According to the study findings, this part of the EIA process has not been emphasized, yet it is during this stage that mitigation measures are implemented. NEMA which is the principal agency in charge of coordination, monitoring, and supervision of all environmental management issues in Uganda should play a leading role.
3. There is need to for an enforcement strategy to ensure that mitigation measures are implemented. It is clear from the results of this study that, relying on voluntary uptake and use of EIA reports is not sufficient to ensure their widespread use to implement mitigation measures. It may therefore be necessary for NEMA to strengthen follow up by increasing the number of environmental audits carried out within the industries.
4. The challenges involved in implementing mitigation measures need to be made known to the developers right from the project proposal so that they are aware that the costs of mitigation implementation are part of the costs for project implementation. This therefore means that, EIA practitioners should endeavor to include in the EIA reports a section on

economic analysis that highlights the costs, benefits and cost-effectiveness of the identified mitigation measures. This will enable proponents of industrial projects to make their budget estimates for project implementation with mitigation measures in their mind.

5.5 Areas for further research

1. A broader study which incorporates more development types other than industries and conducted in different parts of Uganda would draw wider conclusions about the implementation of mitigation measures in Uganda.
2. Future research could also focus on the use of EIA follow up in Uganda. In particular, decision makers should be surveyed in order to ascertain their opinions of the current EIA and follow up practice, as this would provide a wider understanding of the feelings towards follow up.
3. Effectiveness of the recommended mitigation measures could be another area for further research. This mainly comes as a result of most EIA practitioners using a mitigated finding of "no significant impact" on the environment. It is therefore important to determine if these impacts actually do not have significant impacts on the environment.
4. There is also need to investigate the EIA practice and the project design phase of development projects in Uganda. The project design phase had no mention in all the EIA reports regarding mitigation measures. It is therefore not known whether or not development projects in Uganda are subjected to EIA right from the project design stage.

REFERENCES

Ahmad, Y.J. & Sammy, G.K. (1987). *Guidelines to Environmental Impact Assessment in Developing Countries.* London: Hodder and Stoughton.

Arts and Nooteboom. (1999). *Environmental impact assessment monitoring and auditing; Handbook of Environmental Impact Assessment* (Vol. Volume 1). Oxford: Blackwell Science.

Arts, J. Caldwell, P and Morrison-Sounders. (2001). *Environmental impact assessment follow-up: good practice and future directions-findings from a workshop at the IAIA 2000 Conference, Impact Assessment and Project Appraisal.*

Canter et al (1991): Cited in U.S Environmental Protection Agency. (1998). *Resource Manual for EIA review.* Washington.

Canter, L. (1996). *Environmental Impact Assessment* (Second ed.). New York: McGraw Hill Inc.

Christensen et al. (2005). *Environmental Impact Assessment, Tool for Sustainable Development* (Preliminary ed.). Aalborg: Aalborg University.

Clare Harmer. (2005). *Is Improving the Effectiveness of Environmental Impact Assessment in the UK Dependent on the Use of Follow-up? Views of Environmental Consultants. Thesis presented in part-fulfillment of the degree of Master of Science.* Norwich: School of Environmental Sciences, University of East Anglia.

Droruga, N. (1990). *Report on the Purification of Industrial Waste Water, Uganda. A report for the Ministry of Environment Protection.* Kampala: UNIDO.

Glasson, J. Therivel, R. and Chadwick, A. (1999). *Introduction to Environmental Impact Assessment.* London: Spon Press.

Goodwin (2004): Cited in Harmer. (2005). *Is Improving the Effectiveness of Environmental Impact Assessment in the UK Dependent on the Use of Follow-up? Views of Environmental Consultants. Thesis presented in part-fulfillment of the degree of Master of Science.* Norwich: School of Environmental Sciences, University of Anglia.

Justin Ecaat. (2004). *A review of the application of Environmental Impact Assessment (EIA) in Uganda. A report prepared for the United Nations Economic Commission for Africa.* Kampala, Uganda: NEMA.

Kennedy (1999): Cited in Wood, C. (2003). *Environmental impact assessment in developing countries: An overview. Conference on new directions in impact assessment for development; Methods and practice.* Manchester, UK.

Kenneth Kakuru, Rachel Odoi Musoke and Irene Kyakuwaire. (2001). *A guide to the Environment Impact Assessment process in Uganda.* Kampala, Uganda: Greenwatch.

Krejcie, R. V. & Morgan, D. W. (1970). *Determining Sample size for research, activities: Educational and Psychological Measurement, .*

Lauren Tinker. (2003). *Mitigation is the heart of the environmental impact assessment process" (wood, 2003), but is the English EIA system effective at ensuring that mitigation measures are put in place? An assessment, using EISs from five counties. Thesis presented in part-ful.* Norwich: School of Environmental Sciences, University of Anglia.

Lee, (1987): Cited in U.S Environmental Protection Agency. (1998). *Resource Manual for EIA review.* Washington D.C.

Lwasa et al. (2004). *Population, urban development and the environment in Uganda. A case study of Kampala City and its environments.* Kampala: Makerere University, Faculty of Arts.

Marshall. (2001). *Application of mitigation and its resolution within environmental impact assessment: an industrial perspective. Impact Assessment and Project Appraisal.*

Mitchell, J. (1997). *Mitigation in Environmental Assessment; Furthering Best Practice in Environmental Assessment 5(4), 28-9.*

Morrison-Saunders and Arts. (2004). *Introduction to EIA follow-up, Handbook of EIA and SEA follow-up.* London: Earthscan.

Morrison-Saunders et al. (2001). *Roles and stakes in environmental impact assessment follow-up, Impact Assessment and Project Appraisal.*

Morrison-Saunders, A.Baker, J. and Arts, J. (2003). *Lessons from practice: towards successful follow-up; Impact Assessment and Project Appraisal, 21 (1): 43-56.*

NEMA. (1998). *Guidelines for EIA in Uganda.* Kampala, Uganda.

NEMA. (2003). *National Environment (Noise standards and control) regulations.* Kampala, Uganda.

NEMA. (1999). *National Environment (waste management) regulations.* Kampala, Uganda.

Nyangababo, J. T. and Salmeen, A (1987): Cited in Matagi. (2001). *Deposition of airborne elements from Sembule Steel Mill surveyed by moss analysis.* Intern. J. Environ. Stud.

ODA (1992): Cited in Wood, C. (2003). *Environmental impact assessment in developing countries: An overview. Conference on new directions in impact assessment for development. Methods and practice.* Manchester: UNEP.

Sadler et al. (2002). *UNEP Environmental Impact Assessment Training Resource Manual* (2 ed.). Geneva: UNEP.

Samuel Vivian Matagi. (2001). *Some issues of environmental concern in Kampala, the capital city of Uganda.*

Sandy Cooper. (1997). *Urban environmental impact assessment project screening checklist.*

The Republic of Uganda. (1995). *The constitution of Uganda.* Kampala.

The Republic of Uganda. (1995). *The National Environment Act, Cap 153.* Kampala.

The Republic of Uganda. (1994). *The National Environment Action Plan (NEAP) for Uganda.* Kampala.

The Republic of Uganda. (1994). *The National Environment Management Policy for Uganda.* Kampala.

U.S Environmental Protection Agency. (1998). *Resource manual for EIA Review* (Vol. 1). Washington D.C.

UNEP. (2002). *EIA Training Resource Manual. Mitigation and Impact Management* (2 ed.).

Wasswa (1997): Cited in Samuel Vivian Matagi. (2001). *Some issues of environmental concern in Kampala, the capital city of Uganda.*

Wood, C. (2003). *Environmental impact assessment in developing countries: An overview. Conference on new directions in impact assessment for development. Methods and practice.* Manchester.

World Bank. (1991). *Environmental Assessment Source Book Vol.3: Guidelines for Assessment of Energy and Industry Projects.* Washington D.C, USA: The Word Bank.

www.adb.org/Documents/Guidelines/Environmental_Assessment/Content_Format_Environmental_Assessment.pdf.

APPENDIX 1

QUESTIONNAIRE FOR EMPLOYEES OF INDUSTRIAL PROJECTS

Dear respondent;

I am carrying out a study on the "*Implementation of mitigation measures identified during Environmental Impact Assessment (EIA), in selected industrial projects in Kampala district*". To achieve this, I have developed a questionnaire which will take a maximum of 5 minutes to fill and the information will be invaluable to my dissertation. Please note that this study is not an investigation into any activities of your project as an entity. The study is purely academic and any responses obtained will be treated with confidentiality and anonymity as Makerere University has an ethical code that all students are obliged to follow when undertaking research. Kindly respond truthfully. Thank you in advance for your time.

Please Tick (✓) the option that best suits your opinion and where necessary fill in the space provided.

Note: *Mitigation measures are recommendations made during Environmental Impact Assessment (EIA) of projects to prevent adverse environmental impacts from occurring*

SECTION A: Background Information

Sex:	Female □ Male □	**Location of Project**	
Age:	15-20 years □	**Qualification**	Certificate □
	21-30 years □		Diploma □
	31-40 years □		Degree □
	>41 years □		PhD □
Position held		**Administrator's Code**	
Name of Project		**Date**	

SECTION B: Implementation of EIA Mitigation Measures

No-	***STATEMENT***	***RESPONSE***
1	All the EIA mitigation measures have been implemented at our factory/industry	□ ***Agree*** □***Disagree*** □ ***Not sure***
2	Some mitigation measures (recommendations) have not been implemented	□ ***Agree*** □***Disagree*** □ ***Not sure***
3	Air pollution has been reduced at our factory/industry	□ ***Agree*** □***Disagree*** □ ***Not sure***
4	Noise pollution is still a problem at our factory/industry	□ ***Agree*** □***Disagree***

		□ ***Not sure***
5	Solid waste management is still a problem at our factory/industry	□ ***Agree*** □***Disagree*** □ ***Not sure***
6	Workers have been provided with protective wear at our factory/industry	□ ***Agree*** □***Disagree*** □ ***Not sure***
7	Fire fighting machines have been installed at our factory/industry	□ ***Agree*** □***Disagree*** □ ***Not sure***
8	Implementation of EIA mitigation measures has many challenges	□ ***Agree*** □***Disagree*** □ ***Not sure***

SECTION C: Implementation Strategies used

9	As an employee am always involved in activities that ensure that the environment is not degraded	□ ***Agree*** □***Disagree*** □ ***Not sure***
10	An environmental officer has been employed at our factory/industry to follow up the implementation of EIA mitigation measures	□ ***Agree*** □***Disagree*** □ ***Not sure***
11	There is an environmental monitoring plan at our factory/industry to ensure that the environment is not negatively affected	□ ***Agree*** □***Disagree*** □ ***Not sure***
12	The management at our factory/industry normally carries out environmental audits/inspections	□ ***Agree*** □***Disagree*** □ ***Not sure***
13	NEMA regularly carries out environmental audits/inspections at our factory/industry.	□ ***Agree*** □***Disagree*** □ ***Not sure***
14	Community members are always consulted and involved in implementing EIA mitigation measures	□ ***Agree*** □***Disagree*** □ ***Not sure***
15	Environmental awareness is regularly carried out among all employees at our factory/industry	□ ***Agree*** □***Disagree*** □ ***Not sure***
16	As an employee, am not aware of the recommended EIA mitigation measures	□ ***Agree*** □***Disagree*** □ ***Not sure***

SECTION D: Challenges faced in implementing EIA mitigation measures

17	Implementing all the mitigation measures is very expensive	□ ***Agree*** □***Disagree*** □ ***Not sure***
18	Some mitigation measures have not been implemented because it is costly	□ ***Agree*** □***Disagree*** □ ***Not sure***
19	There is lack of a person with necessary expertise to deal with environmental issues at our factory/industry.	□ ***Agree*** □***Disagree*** □ ***Not sure***
20	The recommended mitigation measures do not address the anticipated negative impacts on the environment	□ ***Agree*** □***Disagree*** □ ***Not sure***
21	Some mitigation measures are not achievable i.e. cannot be implemented	□ ***Agree*** □***Disagree*** □ ***Not sure***

22. Which of the following environmental constraints are most common at your industrial project site? *(Please tick all that apply)*

a) Solid waste generation ☐

b) Wastewater discharge ☐

c) Air pollution ☐

d) Noise pollution ☐

23. Suggest what should be done to ensure that EIA mitigation measures are effectively implemented

……
……
……
……
……

END

Thank you for your time.

APPENDIX 2

INTERVIEW GUIDE FOR THE PROJECT MANAGERS

This interaction seeks your critical assessment of the implementation of mitigation measures identified during the EIA process, with reference to industrial projects in Kampala District. Please note that this study is not an investigation into any activities of your project as an entity. The study is purely academic and any responses obtained will be treated with confidentiality. Kindly respond truthfully. Thank you.

SECTION A: Background information

Sex:	Male ( ) Female ( )
Age:	30yrs and below ( ) 30-40yrs ( ) 40yrs and above ( )
Position held	
Years of service	
Name of Project	
Business activity	
Location of the project	

1. What major mitigation measures were proposed for this project and have they been implemented? (Probe for those implemented and those left out and why).
2. Do the mitigation measures sufficiently address the anticipated impacts?
3. How do you deal with the unforeseen residual impacts?
4. Are the recommended mitigation measures achievable? (Probe for whether they are also cost-effective, appropriate and feasible).
5. How often is environmental audit carried out in your project? (Probe for number of times, and recommendations made about the progress of the project).
6. How often do NEMA and other lead agencies monitor the progress of the project to ensure that all necessary action to implement mitigation measures is taken?
7. What measures have you put in place to reduce levels of waste generation and pollutant release? (Probe for solid waste and effluent treatment plants, monitoring and mitigation plans).
8. What are the main challenges hindering the implementation of the recommended mitigation measures? What should be done for mitigation measures to be effectively implemented?
9. Any other comments?

Thank you for your time

APPENDIX 3

INTERVIEW GUIDE FOR NEMA AND KCC OFFICIALS

This interaction seeks your critical assessment of the implementation of mitigation measures identified during the EIA process, with reference to industrial projects in Kampala District. Please note that this study is not an investigation into any activities of your job. The study is purely academic and any responses obtained will be treated with confidentiality. Kindly respond truthfully. Thank you.

SECTION A: Background information

Sex:	Male ( ) Female ( )
Age:	30yrs and below ( ) 30-40yrs ( ) 40yrs and above ( )
Position held	
Years of service	
Name of Organization	

1. What are your major roles regarding implementation of EIA mitigation measures?
2. What major strategies do you use to ensure that the mitigation measures are implemented?
3. How do you deal with developers of industrial projects who do not comply with the requirement for impact management?
4. What are some of the challenges faced in ensuring that EIA mitigation measures are implemented?
5. How do you overcome the above challenges?
6. Suggest what should be done to ensure that EIA mitigation measures are effectively implemented.
7. Any other comments?

Thank you for your time

APPENDIX 4

OBSERVATION CHECKLIST FOR THE RESEARCHER

SECTION A: Background Information

a) Name of project: ……..

b) Nature of activity……

c) Location…….

d) Type of industry (Wet or Dry)……

SECTION B: Items to be observed

1. EIA Report

Implementation Schedule

No	Predicted adverse environmental impacts	Recommended Mitigation Measures to address the impacts	Action taken to achieve the objectives of the recommended mitigation measures
1			
2			
3			
4			
5			
6			
7			

2. Mitigation Plan (Mitigation strategies used)

a)……

b)……

c)……

d)……

e)……

f)……

3. Monitoring plan

4. Effluent treatment plant

5. Solid waste treatment plant

6. Solid waste disposal site

7. Effluent disposal site

Others

END

APPENDIX 5

FOCUS GROUP DISCUSSION GUIDE FOR NEIGHBOURING COMMUNITIES TO THE INDUSTRIAL PROJECTS

This interaction seeks your critical assessment of the implementation of mitigation measures identified during the EIA process, with reference to industrial projects in Kampala District. Please note that this study is not an investigation into any activities of your neighbouring industrial project as an entity. The study is purely academic and any responses obtained will be treated with confidentiality. Kindly respond truthfully. Thank you.

1. How does your neighboring project impact on the environment?
2. Are you always involved in looking for solution to reduce or stop the negative impacts on the environment?
3. How have you benefited from your neighbouring industrial project?
4. How have you been affected by your neighbouring industrial project?
5. What are the common challenges associated with implementation of EIA mitigation measures?
6. What do you think should be done to improve the implementation of EIA mitigation measures?

END. Thank you for your time.

APPENDIX 6

TABLE FOR DETERMINING SAMPLE SIZE FROM A GIVEN POPULATION

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
***S* is sample size**

Source: Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample size for research activities: *Educational and Psychological Measurement, 30*, 607-610

APPENDIX 7

LIST OF ENVIRONMENTAL IMPACT STATEMENTS USED IN THE STUDY

Babito Industries (U) Limited (2002): *Food Processing Plant*, Plot 427, Factory Close, Ntinda Industrial Area, Kampala

Blue Wave (U) Limited (2003): *Water Bottling Plant (Blue Wave)*, Plot 7, Spring Close, at Bugolobi, Nakawa Division

Britania Products Uganda Limited: *Foods and Beverages*, Plot 247B, Ntinda Industrial Area

Euroflex Limited (2004): *Eurofoam Mattress Manufacturing Plant*, Plot 48-50, along Makabya Road (Plot 514, Jinja RD), Nakawa Industrial Area, Nakawa Division, KCC

Gouda Gold Limited (2004): *Gouda Gold Cheese Processing Plant* Plot 47/49, along Port Bell Road, at Luzira

Graphic Systems U Ltd (2008): *Manufacturing plant for corrugated carton, printing and packaging*, Plot 1, 4th link Rd, Luzira Industrial and business park, Nakawa Division, Kampala City Council, Kampala District

Oasis Beverages Limited (1999): *Beverages Factory for Production of Traditional Non-Alcoholic Beverages*, Nakawa Industrial Area Kampala

Rwenzori Beverage Company Limited (2005): *Plastic Recycling Industry*, Plot M-463, in Nakawa Industrial Area, Kampala City Council

Sameer Agriculture and Livestock Limited (2008): *Sameer Powdered Milk Processing Plant*, Plot 49-53/55 Along 5th Street, Kampala Industrial Area, Kampala District

SPA Packaging (U) Limited (2003): *Development of a Plastics Manufacturing Plant*, Plot 62, on Makabya Road, in Nakawa-Kyambogo Industrial Area, Nakawa Division, Kampala City Council

Uganda Meat Industries Ltd (2000): *Rehabilitation and Modernisation of Abattoir*. Plot 5, Old Portbell Road,Kampala District

APPENDIX 8

Chi square test results showing whether or not implementation of mitigation measures is independent of industrial type

The Chi-Square test was carried out to test the null hypothesis that implementation of mitigation measures is independent of the type of industry. The Chi-Square value was calculated using the formula below;

$$\chi^2 = \Sigma \frac{(f_o - f_e)^2}{f_e}$$

Where Σ is summation

χ^2 is the symbol for chi square

f_o denotes the frequency of the observed data

f_e is the frequency of the expected values

The expected frequency of a cell was calculated using the formula below;

$$f_e = \frac{Row\,total\ x\,Column\,total}{Grand\,total}$$

The observed and expected frequencies are presented in the table below;

	Agree			Disagree			Not sure			Total
	f_o	f_e	$\frac{(f_o - f_e)^2}{f_e}$	f_o	f_e	$\frac{(f_o - f_e)^2}{f_e}$	f_o	f_e	$\frac{(f_o - f_e)^2}{f_e}$	
Wet	6	6.67	0.067	19	17.22	0.184	5	6.11	0.202	30
Dry	6	5.33	0.084	12	13.78	0.229	6	4.89	0.252	24
Total	12			31			11			54

From the table, it can be observed that;

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

$= (0.067 + 0.184 + 0.202)_{wet} + (0.084 + 0.229 + 0.252)_{dry}$

$= 0.453 + 0.565$

$= 1.023$

Therefore, χ^2 observed = 1.023

Degree of freedom (df) was calculated from the formula;

$df = (C - 1)(R - 1)$

Where **C** is the number of categories of the column variable and **R** is the number of categories of the row variable, i.e. df = (3-1) (2-1) = 2

The critical value of Chi-Square that is tabulated (See Appendix 9) = 5.99, at df = 2 and α = 0.05.

Thus, χ^2 observed (1.023) < χ^2 tabulated (5.99)

APPENDIX 9

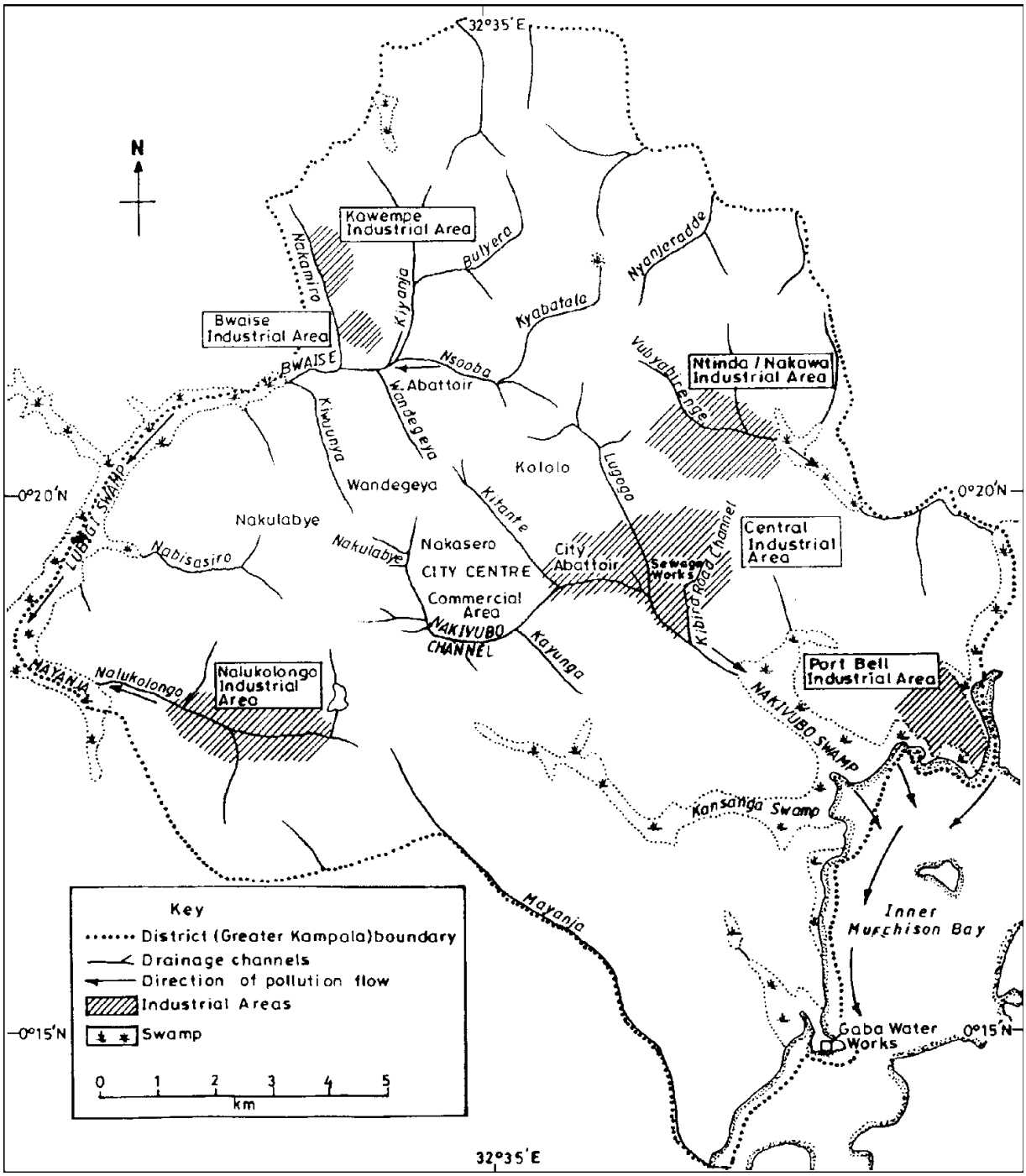
Chi-Square Distribution Table

Degrees of Freedom *(df)*	**Probability** (*p*)										
	0.95	0.90	0.80	0.70	0.50	0.30	0.20	0.10	0.05	0.01	0.001
1	0.004	0.02	0.06	0.15	0.46	1.07	1.64	2.71	3.84	6.64	10.83
2	0.10	0.21	0.45	0.71	1.39	2.41	3.22	4.60	5.99	9.21	13.82
3	0.35	0.58	1.01	1.42	2.37	3.66	4.64	6.25	7.82	11.34	16.27
4	0.71	1.06	1.65	2.20	3.36	4.88	5.99	7.78	9.49	13.28	18.47
5	1.14	1.61	2.34	3.00	4.35	6.06	7.29	9.24	11.07	15.09	20.52
6	1.63	2.20	3.07	3.83	5.35	7.23	8.56	10.64	12.59	16.81	22.46
7	2.17	2.83	3.82	4.67	6.35	8.38	9.80	12.02	14.07	18.48	24.32
8	2.73	3.49	4.59	5.53	7.34	9.52	11.03	13.36	15.51	20.09	26.12
9	3.32	4.17	5.38	6.39	8.34	10.66	12.24	14.68	16.92	21.67	27.88
10	3.94	4.86	6.18	7.27	9.34	11.78	13.44	15.99	18.31	23.21	29.59
	Non-significant								**Significant**		

Source: R.A. Fisher and F. Yates, Statistical Tables for Biological Agricultural and Medical Research, 6th ed., Table IV, Oliver & Boyd, Ltd., Edinburgh, by permission of the authors and publishers. (http://www2.lv.psu.edu/jxm57/irp/chisquar.html), 11th June 2009, 3:30pm

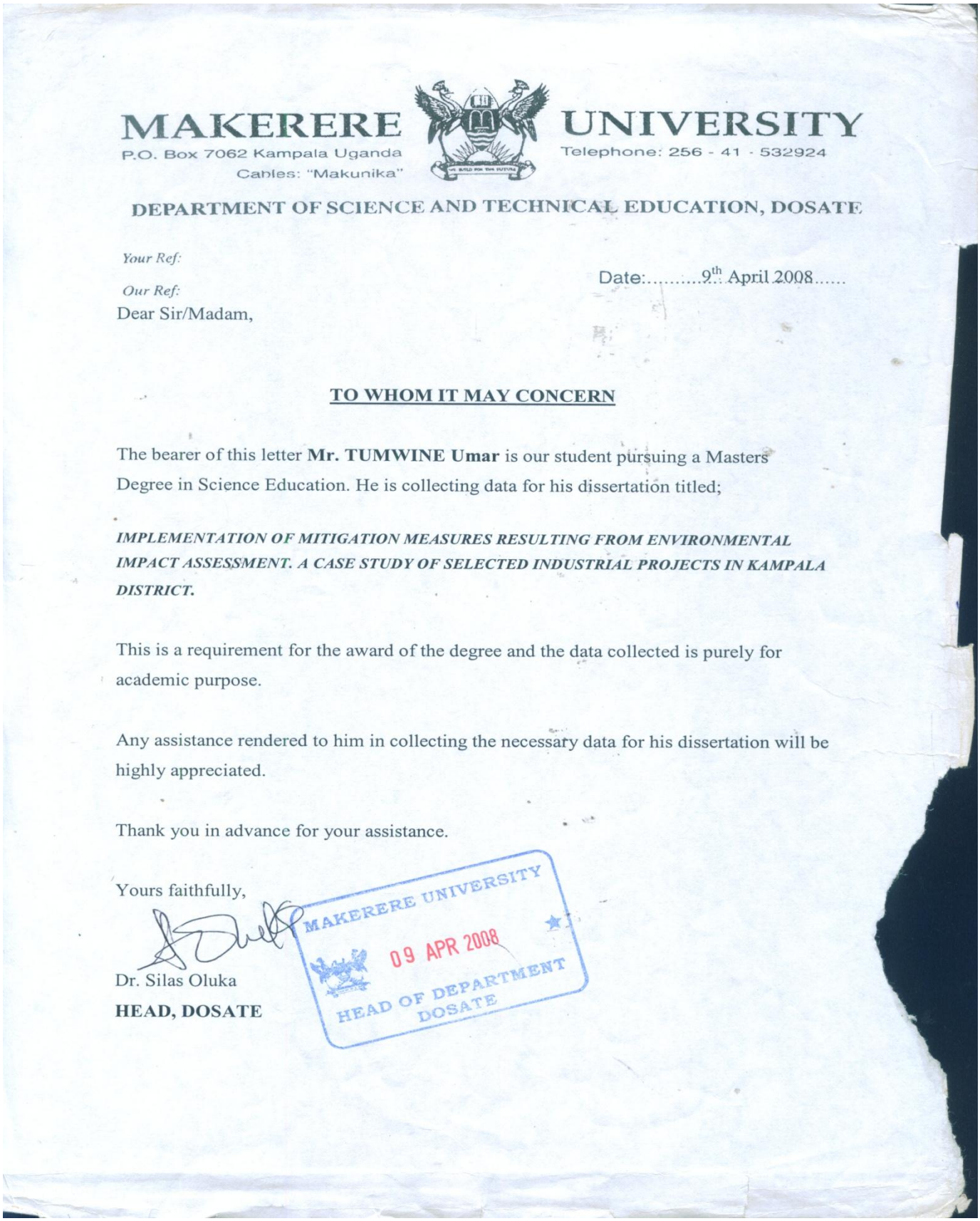
APPENDIX 10

Map of Kampala showing the major industrial areas from which the study industries were selected (Map adopted from Matagi 2001)



APPENDIX 11

Letter of introduction from DOSATE



MAKERERE UNIVERSITY

P.O. Box 7062 Kampala Uganda
Cables: "Makunika"

Telephone: 256 - 41 - 532924

DEPARTMENT OF SCIENCE AND TECHNICAL EDUCATION, DOSATE

Your Ref:

Our Ref:

Date:.....9th April 2008.....

Dear Sir/Madam,

TO WHOM IT MAY CONCERN

The bearer of this letter **Mr. TUMWINE Umar** is our student pursuing a Masters Degree in Science Education. He is collecting data for his dissertation titled;

IMPLEMENTATION OF MITIGATION MEASURES RESULTING FROM ENVIRONMENTAL IMPACT ASSESSMENT. A CASE STUDY OF SELECTED INDUSTRIAL PROJECTS IN KAMPALA DISTRICT.

This is a requirement for the award of the degree and the data collected is purely for academic purpose.

Any assistance rendered to him in collecting the necessary data for his dissertation will be highly appreciated.

Thank you in advance for your assistance.

Yours faithfully,

MAKERERE UNIVERSITY
09 APR 2008
HEAD OF DEPARTMENT
DOSATE

Dr. Silas Oluka
HEAD, DOSATE

APPENDIX 12

Letter of intention to submit dissertation to the Graduate School

School of Education
DOSATE
Makerere University
P.O Box 7062
Kampala, Uganda

22nd Sept. 2009

The Director
School of Graduate Studies
Makerere University

Through
Dr. Joseph Oonyu (Supervisor)

Dear Sir/Madam

RE: <u>Intention to Submit Dissertation</u>

I **Tumwine Umar (2006/HD04/7546U)** write to notify your office of my intention to submit my dissertation in the next one month's time, after recommendation from my supervisor. My research study is ***"Implementation of mitigation measures resulting from Environmental Impact Assessment, in selected industries in Kampala district".***

Yours sincerely

Tumwine Umar
(**Candidate**)

Cc Dean School of Education
Cc Head DOSATE
Cc Personal file