

AN EVALUATION OF THE EFFECTIVENESS OF THE  
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS IN  
ZAMBIA: A CASE OF THE  
CHILANGA CEMENT PLANT

BY

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A Dissertation submitted to the University of Zambia in partial fulfillment of  
the requirements for the Master of Science in Environment and Natural  
Resources Management.

The University of Zambia

Lusaka

2024

## **DECLARATION**

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This dissertation by Mwelwa Patricia was approved as fulfilling the requirements for the award of the Degree of Master of Science in Environment and Natural Resources Management.

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## **DEDICATION**

This thesis is dedicated to my Mother for her inspiration, spiritual and moral support.

## ACKNOWLEDGEMENTS

I am indebted to **Dr. Kasonde Mundende** and **Dr. Orleans Mfunne** for their patience, careful supervision and encouragement throughout the year of my candidature.

I would like to thank my **family**, especially my mother **Bridget Moya**, for the encouragement and moral support over the year of my candidature. Finally, my thanks go to all the people who were involved in the interview, focus group discussion, and those who responded to the questionnaires for devotion of their time and energy.

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## ACRONYMS AND ABBREVIATIONS

AMCEN:	African Ministries for Environment
CEM:	Centre for Environmental Management
CDC:	Commonwealth Development Cooperation
ECA:	Economic Commission for Africa
ECZ:	Environmental Council of Zambia
EIA:	Environmental Impact Assessment
EIS :	Environmental Impact Statement
EMA :	Environmental Management Act
EMP:	Environmental Management Plan
EPPCA:	Environmental Protection and Pollution Control Act
IAIA:	International Association for Impact Assessment
IAPs:	Interested and Affected Parties
IUCN:	International Union for Conservation of Nature and Natural Resources
LCP:	Lafarge Cement Plant
NCS:	National Conservation Strategy
NEAP:	National Environmental Action Plan
NEPA:	National Environmental Policy Act
SAIEA	: Southern African Institute for Environmental Assessment
UNCED:	United Nations Conference on Environment and Development
UN:	United Nations
ZEMA	: Zambia Environmental Management Agency

## ABSTRACT

The study sought to evaluate the effectiveness of Environmental Impact Assessment (EIA) in Zambia using the Chilanga plant as a case study. The objectives of the study were to evaluate the quality of the EIA process conducted at Chilanga plant against international EIA standards; assess the extent to which environmental mitigation measures identified in the EIA report for Chilanga plant have contributed to the reduction of environmental problems emanating from the plant; and to examine the extent to which the affected public participated in the EIA process of the Chilanga Cement plant.

The research embraced qualitative methods because it provided a deep understanding of the responses, moreover, this allowed for triangulation of results (Creswell, 2007). Within this framework an embedded research design was adopted in which the researcher collected and analysed both types of data at the same time. The qualitative data was embedded in the quantitative data in the interpretation of the overall results. The study used the Lee and Colley review package to analyse the effectiveness of EIA at Chilanga Cement plant throughout the entire cycle of the process focusing on the prediction and mitigation of impacts, public participation, monitoring and follow-up, and to assess the strengths and weaknesses of EIA in Zambia based on feedback from a variety of stakeholders involved in the process and to identify gaps and or factors which limit effectiveness. This was achieved through a critical review of existing literature and policy documents, from which the study drew concepts and ideas that informed the proposed study.

The key finding of the study showed that EIA is a well-established environmental management tool in Zambia. Nonetheless, the findings also indicate that there were inadequacies in the implementation process within the environmental sector. The inadequacies were particularly in areas relating description of the development, identification, evaluation and mitigation of key impacts, consideration of alternatives, and consultation and participation of the public.

**Keywords:** Environmental impact assessment, effectiveness, quality of EIA reports, Zambia

## **CHAPTER ONE: INTRODUCTION**

### **1.1 Overview**

Chapter one presents the background, the statement of the problem, aim of the study, specific objectives, research questions, and the significance of the study.

### **1.2 Background of the Study**

The field of environmental impact assessment has been evolving rapidly worldwide. By the end of 2010, more than 100 countries had some form of EIA regulation, although EIA practices vary widely across countries (JICA, 2010).

EIAs have been widely adopted in developing countries over the past years. However, evidence suggests that EIAs are not having their intended impact and implementation of procedures is weak (Bitondo et al., 2014, Clausen et al., 2011, Khadka & Shrestha, 2011, Marara et al., 2011). In general, EIAs in Africa still appear plagued by a lack of trained personnel, inadequate budgets, and the concern that EIAs might hold back economic development (Kakonge 1999). All countries in South and Central America have environmental protection legislation that includes requirements for at least some aspects of EIAs. Specifically, in South America the development of EIAs has been hampered by political instability, inefficient bureaucracy, economic stagnation, and external debt (Brito and Verocai 1999). According to Glasson (2000), EIA in South America often is carried out after a project has been authorised and with little or no public participation.

Countries in the South Asia region (SAR) have adopted the Environmental Impact Assessment (EIA) as their main environmental management tool for public and private investments. Although supposedly based on the United States National Environmental Protection Act (U.S. NEPA) enacted in 1969, EIA systems in SAR have been designed with different nature and objectives from the U.S. system, and often used to regulate environmental planning and management of investment projects. Spurred by international organizations and development banks, SAR countries have adopted EIA systems with common features, incorporating in their design the key elements of what could be considered an international standard (Sanchez-Triana et al. 2014). While each

EIA system has its own procedures, they all require an assessment of relevant environmental impacts of all significant actions and the consideration of the EIA findings as a determinant for decision-making. Different from the U.S. NEPA, however, EIA systems in SAR countries require impact mitigation measures specifically tailored to the investment projects.

All countries in South and Central America have environmental protection legislation that includes requirements for at least some aspects of EIAs. Specifically, in South America the development of EIAs has been hampered by political instability, inefficient bureaucracy, economic stagnation, and external debt (Brito and Verocai 1999). According to Glasson and Salvador (2000), EIA in South America often is carried out after a project has been authorized and with little or no public participation.

Gamu et al. (2015), who investigated evidence of the relationship between poverty indicators, including environmental pollution and mining from 52 empirical studies most of which were gathered from developing countries, recently examined the extent to which EIAs are failing to achieve their intended impact.

The increasing tendency towards industrialisation and urbanisation in developing countries is having enormous impacts on natural and man-made environments (Alshuwaikhat, 2005). Pollution sources have increased with the implementation of projects associated with growing cities and cause contamination of air, land, water and soil (Alshuwaikhat, 2005). These problems pose a serious threat to the full realisation of the socio-economic contribution that cities of different countries make. They also compound inequities, and threaten the sustainability of development achievements (Habitat, 1998). In this regard, the concept of sustainable development has emerged as a goal aimed at developing the resources of cities in ways that will minimise these problems.

The EIA brings to notice the environmental impacts of the proposed project to guide planning decisions for project implementation with the involvement of local interest groups, regulatory bodies, and the general public. Increase in population, technological advancement, and rising energy demand has created a serious strain on the environment. The effluents from manufacturing industries are discharged into the environment with

negative impacts that threaten human existence and ecosystems. Also, the operations and failure of some production entities constitute a threat to humans in the immediate vicinity and the biodiversity of the entire environment. The threat of the operation of some production firms may be apparent or unnoticed with the consequence that the harm is not noticed until it reaches some dangerous proportions. The wellbeing of man and other animals on the planet is governed by the quality of the environment giving justification to the need to address environmental challenges during project planning. The EIA is a standard instrument to carry out sustainable development with the minimization of the degradation of the environment (Yusuf et al., Durojaiye, 2007).

The rapid increase in the Nigerian population and its economic progression requires electricity generation and availability (Cepin, 2011). The thermal power plants that constitute the main power supply base are plagued with low-capacity utilization as a result of numerous challenges. It has been established that in order to diversify the electrical power generation base of Nigeria for improved and sustainable power availability, the assessment and development of potential hydroelectric power sources is imperative (Olaoye et al., 2016). Nigeria is endowed with several potential hydroelectric power sources that can generate substantial quantity of electricity to power industrial processes in the economy (Abdulkadir et al., 2013). The main focus of research and development efforts in hydropower generation is currently on the development of small hydro technology because of the low environmental impact (Vasiliev et al., 2013). Small hydropower plants have capacities between 1 – 30 MW (Directorate of Energy, 2018). The physical environment is affected rather significantly by the development and operation of a hydropower station especially large hydropower (Bobat, 2017). The diversion of the river and associated construction work during reservoir construction negatively impact the quality of water downstream and causes a severe restriction in flow volume. This disrupts quality water availability downstream and affects the life pattern and structure of the aquatic ecosystem. The physical, geomorphological, and chemical properties of the river may be transformed. The sudden release of water from reservoirs may cause heavy erosion that may wash away farmlands, changes erosion patterns and the quantity and nature of sediments carried downstream. All these may have far reaching effects in a particular environment (Bobat, 2017). It is essential that an Environmental Impact Assessment be carried out for every proposed hydropower

project to determine the feasibility of the project from an environmental perspective. The aim of this study is to carry out an environmental impact assessment of a small hydropower plant on River Orle, Auch, to determine the impact of the project in the immediate and extended environment.

In this articulation, sustainable development seeks to establish a path along which development can progress while enhancing the quality of life of people and ensuring the viability of the natural systems on which that development depends (CSIR 2001).

Sustainable development is required to avert the environmental concerns discussed in the preceding paragraph. According to the World Commission on Environment and Development (1987), “sustainable development is development which seeks to meet the needs and aspirations of the present without compromising the ability to meet those needs of the future”. It encompasses three pillars, namely economic, environment and society. The economic component seeks to efficiently manage the economy to meet material needs, while the environmental component is concerned with the conservation and enhancement of the physical and biological resource base and ecosystems. The social pillar, on the other hand, refers to meeting the basic needs of society (UNDESA, 2002). Sustainable development, therefore, provides a framework for managing human and economic development while ensuring a proper and optimal functioning natural environment.

One of the tools used to achieve sustainable development is EIA. The purpose of EIAs is to identify and examine project impacts and come up with relevant mitigation measures for the identified impacts. Thus, the process is an anticipatory environmental management tool. If the process is fully integrated into the project design cycle, it can enable developers to identify environmental issues at an early stage, allowing them to minimise or eliminate the adverse impacts on the environment (Glasson et al., 1999). This may lead to improved relations between the developer, the local authority, and the local communities and, therefore, lead to a smoother planning process.

Highly interdisciplinary in nature, environmental assessments work by integrating information from the biophysical and social sciences to objectively analyse and evaluate the immediate and long-term impacts and consequences associated with project

proposals, strategic plans, policies of government and industry. The potential value of EIA as a tool for sustainable development has been highlighted in several international environment forums key of which was the 1992 UN Conference on Environment and Development (UNCED). To this effect, countries have agreed on the need to develop measures that would avoid the effects arising from development activities.

Miccoli et al. (2014) explain that the Chilanga Cement plant is an old plant, which commenced cement production in 1951, before EIA was introduced in Zambia. There was no assessment of the effects the plant would have on the environment. However, over the years, pollution problems, and consequent environmental degradation, have been gradually aggravated and throughout this period, much attention was given economic growth, without due regard to environmental consequences. Over the years, cement demand in Zambia has increased rapidly due to the continued expansion of the construction industry, driven by fast urbanisation. From the year 2000, attention to environmental protection and interest in environmental issues related to construction grew rapidly, and environmental considerations have become one of the main criteria for formulating social and economic policies.

The increased demand for cement and its associated environmental impacts necessitated the need for an EIA. Through the Environmental Protection and Pollution Control Act (EPPCA) of 2007, EIA was introduced in Zambia. In compliance with the environmental regulations, Chilanga (then Lafarge) signed a memorandum of understanding with the Zambia Environmental Management Agency (ZEMA) to conduct an Environmental Impact Assessment (EIA) for the newly proposed Chilanga II (TUKULE) cement mill and packing plant and to ensure that the plant complied with environmental standards set forth (ECZ, 2010).

This was because of the predominant use of carbon-intensive fuels, such as coal in clinker making, which made the cement industry a major source of carbon dioxide (CO<sub>2</sub>) emissions. Besides consuming energy, the clinker-making process emits CO<sub>2</sub> during calcining (Taylor et al., 2006). Because of these two emission sources, in addition to the emissions from electricity production, the cement industry is a major source of carbon emissions and deserves attention in the assessment of carbon emission-

reduction options. The environmental impact assessment, performed within clearly defined and consistently applied boundaries, will provide a value for the impact of cement production on the environment. Despite EIA being conducted on the plant, some studies have shown that environmental impacts have continued to impact negatively on biodiversity and the health of many residents (Nkama et al., 2017). This has raised concerns as to why EIA has not been able to provide environmental sustainability in most cases.

Against this background, this study seeks to evaluate the effectiveness of the EIA process in identifying and mitigating the environmental impacts through the Chilanga cement plant as a case study.

### **1.3 Research Problem**

In any industrial setup, a lot of wastes are produced. These may include solid, liquid and gas or a combination of the three waste products (International Energy Agency, 2009). Other than these forms of waste, there are also nuisances that are produced, such as noise, vibrations, air pollution, and poor visibility. Chilanga district is no exception to these problems because of the existence of a cement plant, which is situated right in the Central Business District (CBD). The major environmental concerns are air pollution and dust emissions.

Sources of the dust emissions in Chilanga include the clinker cooler, crushers, grinders, and materials-handling equipment. These emissions are not only deteriorating air quality but also degrading human health and have local and global environmental impact as they may contribute to global warming, ozone depletion, acid rain, biodiversity loss and reduced crop productivity. Mungwa (2017) and Nkama et al. (2017) provided evidence from their findings on the health impacts of cement production on the residents of Chilanga. However, they did not examine the role that EIA can play in mitigating the environmental impacts resulting from cement production. This creates a gap which this study examined. To date, there has been no systematic study that has focused on the role of EIA and its effectiveness in mitigating environmental problems emanating from different production processes in Zambia. If this study is not conducted, the role of EIA in mitigating environmental problems

associated with cement production at the Chilanga plant may not be understood and problems may continue.

Therefore, this study sought to evaluate the effectiveness of the EIA process in identifying and mitigating environmental impacts of the Chilanga Cement plant. This is because growing recognition of the importance of addressing environmental issues early in project planning is critical for incorporating sustainability assurances in planning of development projects in economic sectors.

#### **1.4 Purpose of the Study**

The purpose of this study was to evaluate the effectiveness of the Environmental Impact Assessment (EIA) in mitigating the environmental problems at Chilanga Cement Plant.

#### **1.5 Objectives of the Study**

The objectives of the study were to:

- i. evaluate the quality of the EIA process conducted at Chilanga Cement plant against international EIA standards;
- ii. assess the extent to which environmental mitigation measures identified in the EIA report for Chilanga Cement plant have contributed to the reduction of environmental problems emanating from the plant;
- iii. examine the challenges faced in the implementation of mitigation measures;
- iv. Examine the extent to which the affected communities participated in the EIA process of the Chilanga Cement plant.

#### **1.6 Research Questions**

The following research questions guided the study:

- i. How does the EIA process conducted at Chilanga Cement plant conform to internationally accepted EIA standards?
- ii. What challenges have been faced in the implementation of the mitigation measures?
- iii. In what ways have the mitigation measures proposed in the EIA report led to the

reduction of the environmental problems at the Chilanga plant?

- iv. To what extent did the public participate in the EIA process at the Chilanga Cement plant?

### **1.7 Significance of the Study**

This study is significant not only for the Chilanga Cement plant, but also for other projects involving EIAs. The findings of this research may prove useful for policy makers and help in the management of the environment both at local and national levels. Both ZEMA and local communities could also use the results of this study as it draws on the experiences and knowledge of several stakeholders. This research may provide information to environmental agencies and help come up with policy formulation on the EIA practice in Zambia, and help understand the functioning of the system and establish ways to improve the process.

### **1.8 Chapter Summary**

This chapter has introduced the purpose of the research. The main aim, objectives and research questions of the study have been sufficiently presented. Furthermore, the fundamental aspects of the study have been discussed in this chapter. In conclusion, this study assumes that EIA may prove useful in the management of the environment and establish ways to improve the process.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1. Overview**

This chapter is dedicated to literature review in order to present what other authors have proposed or observed with regard to the issues under investigation, and to identify the “gaps” in knowledge (May, 2001). The main subtitles in this chapter are; the definition of EIA, evolution of EIA, EIA and sustainable development, EIA practice in Zambia, effectiveness of EIA and the review of EIA.

Environmental Impact Assessment (EIA) was first established as a response to increasing concerns regarding the environmental effects of major developments (IEMA, 2004). The United States (US) became the pioneer country to establish the first comprehensive environmental protection law, known as the National Environmental Policy Act (NEPA) in 1969. NEPA provided a baseline for EIA legislation throughout the world. The US EIA model and that of other developed countries share basic principles and reflects commonly agreed upon approaches to similar problems (Li, 2008).

### **2.2. Definition of EIA**

Environmental Impact Assessment (EIA) is defined as a process in which the potential environmental impacts of a major development project on the natural and man-made environment are examined (Fuggle & Rabbie, 2009). Glasson, Therivel and Chadwick (2005) stress that EIA aims to examine potential environmental effects associated with development and that it ensures consideration of environmental consequences during project design. EIA identifies potential environmental impacts (including bio-physical, socio-economic and cultural) and explores alternatives and measures that can be applied to minimise negative impacts and maximise positive ones for the protection of the environment (Centre for Environmental Management (CEM, 2006). Glasson et al. (1999) state the main purposes of EIA as an aid to decision making, preparation of development plans and contribution towards sustainable development.

The focus on EIA practices has led to the development of a wide field of research on the issue of effectiveness. The difficulties that both legislation and EIA practices have in

conforming themselves to the models of the process itself are widely recognised by the literature and they are often idealised and excessively rational (Glasson et al., 1997; Barker & Wood, 1999). Referring to the effectiveness of the EIA, this study has as its main reference to the theoretical approach of Sadler (1996), which is still valid and contemporary, and which has influenced many subsequent reflections on this topic (Cashmore et al., 2004; Glasson et al., 2005; Christensen et al., 2005; Pischke & Cashmore 2006; Jay et al., 2007). Effectiveness can be investigated both in its substantial characteristics (that is, in its ability to reach the pre-established purpose) and in its procedural characteristics (that is, whether it is undertaken according to established expectations) (Cashmore et al., 2004).

The substantial objectives of EIA can be divided in two groups: Proximate aims which are the proximate aims are those that see the EIA as a system aimed at preventing possible impacts before the projects are implemented (Wood, 2003), and as a decision-making tool, principally in relation to the release of an environmental authorization, but also for its influence on development designs. The long-term objectives: are those linked to the overall action of the EIAs, which should lead to sustainable development, more careful to the environment, ensuring a correct balance between social, economic and environmental interests. The effectiveness of the EIA in these terms appears to be rather scarce, and it does not reach the aims neither in terms of proximity nor in the long term (Cashmore et al., 2004).

### **2.3. Evolution of Environmental Impact Assessment**

EIA has undergone evolution over time. Before the First World War, rapid industrialisation and urbanisation in western countries was causing rapid loss of natural resources. This continued to the period after the Second World War, giving rise to concerns for pollution, quality of life and environmental stress (Ogola, 2007). In the early 1960s, investors and people realised that the projects they were undertaking were affecting the environment, resources, raw materials and people. As a result of this, pressure groups formed with the aim of getting a tool that could be used to safeguard the environment in any development. The USA decided to respond to these issues and established a National Environmental Policy Act (NEPA) in 1970 to consider its goal in terms of environmental protection. This was the first time that EIA became the official

tool to be used to protect the environment (US Environment Protection Agency, 1993).

From its inception, EIA was designed as an aid to decision making (Glasson et al., 2005). Through mitigation measures proposed in the EIA, environmentally harmful project impacts are avoided, minimised or compensated as much as possible. Thus, in Glasson (2005) view, mitigation measures in EIA are at the centre of sustainable development.

The position commonly agreed among EIA researchers is that, when properly carried out, EIA can minimise environmental degradation by identifying problems before they occur and suggest the strategies required to protect the environment from humans. In the long term, the ultimate purpose of EIA is to help achieve sustainable development (Glasson et al., 1999). The general perception in the literature is that, within EIA, social and environmental issues are interrelated and must be treated equally. This goes with legal frameworks of EIA, which also include social impacts and specify precisely what social impacts are. For example, under the NEPA of 1969, project proponents were expected to assess the impacts of planned interventions on the physical, cultural and human environment (Stolp, 2006).

#### **2.4 Evolution of EIA in Zambia**

EIA was introduced in Zambia in response to the increasing impacts of developmental activities on the environment (ECZ, 2005). The Government of Zambia adopted the National Conservation Strategy (NCS) in order to harmonise environmental management in the country. The NCS was commissioned following the concern by the International Union for Conservation of Nature and Natural Resources (IUCN). This was a response to escalating global environmental problems and the growing shortages of natural resources for supplying the world's population (NCS, 1985). The main goal of the strategy was to satisfy the basic needs of all people of Zambia, both present and future generations through the wise use of natural resources.

However, the NCS lacked guidelines for land and natural resources allocation and conservation according to their productive capacities, inadequate coordination between current conservation and development efforts, which caused both duplication of activity

and gaps in coverage and means that conservation principles were not included in the planning of development projects (Chabwela, 2005). This led to the adoption of the National Environmental Action Plan (NEAP) in 1992. The main thrust of NEAP was to identify environmental issues and problems, analyse their causes and recommend measures to resolve the issues for each sector. This further led to the enactment of the Environmental Protection and Pollution Control Act (EPPCA) of 1997 as a demonstration of their commitment to the Rio Declaration.

Under the EPPCA, Environmental Impact Assessment (EIA) became a legal requirement prior to which, the process was largely optional and carried out only on mutual agreement between project developer and government (ECZ, 2001). The Act requires that an EIA process be carried out for all development projects listed in its schedule which are likely to have a negative impact on the environment. No project is allowed to commence implementation without first passing through the EIA process and obtaining authorization from Zambia Environmental Management Agency (ZEMA) according to (part II section 29) of the Act.

Project proponents are expected to undertake EIA and submit the report to ZEMA. During project implementation, the project proponent is required obliged to fulfil the terms and conditions of the EIA authorization license given to them as stipulated in part IV section 33 of the Act (EMA, 2012). The law also allows for the imposition of a fine on any project owner who commences implementation of a project without obtaining authorization from ZEMA or those who make false presentations in the EIS according to part XI section 117 of the Environmental Management Act of 2011. Figure 1 shows the EIA process that must be followed by the project proponent in Zambia.

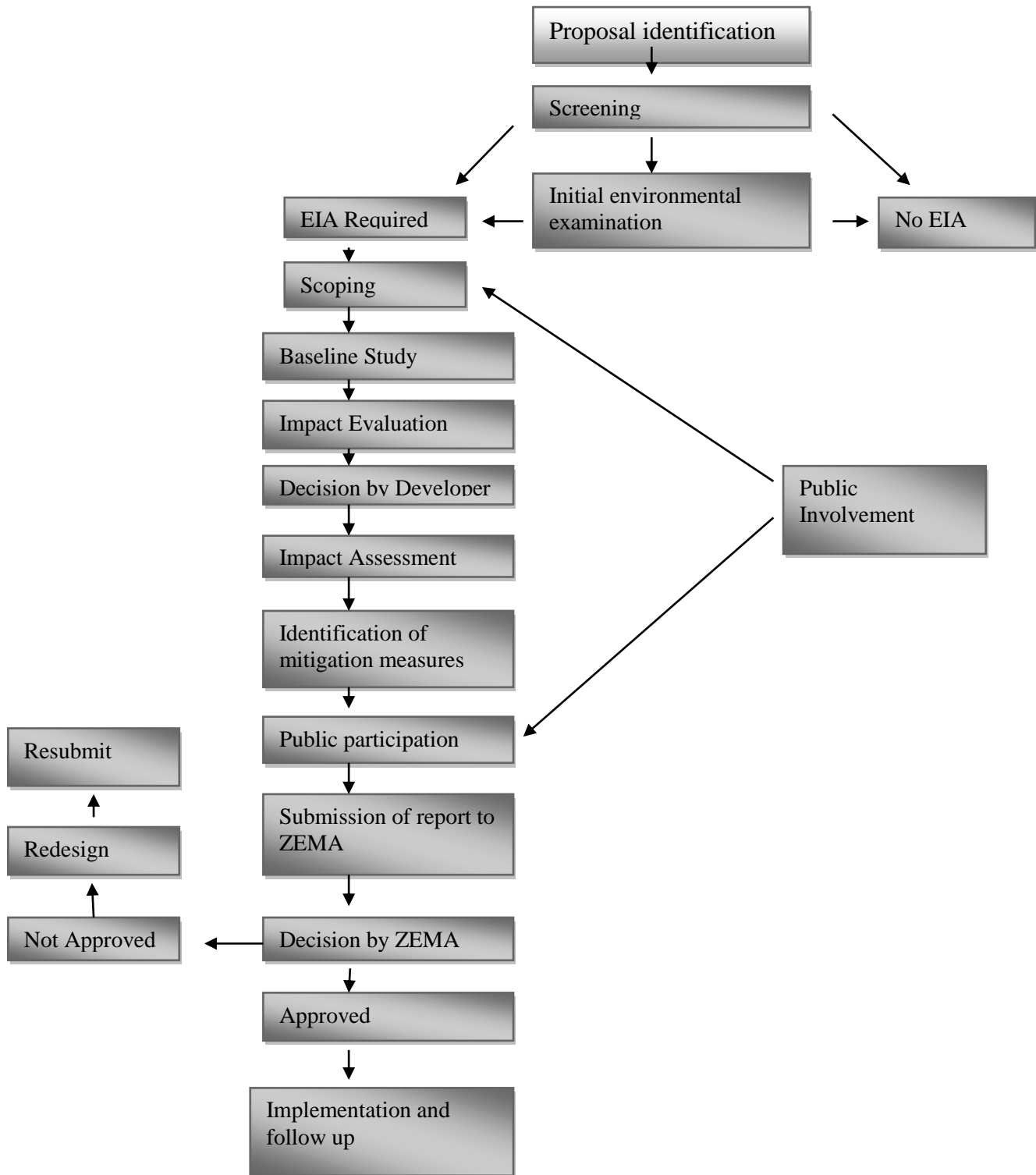


Figure 1: Stages in conducting a full EIA.

(Source: ECZ, 2005)

The following sections present some literature on how some of the steps in EIA are related to sustainable development:

**i) Alternatives**

It appears generally to be recognised that consideration of alternatives is often a weakness in developing country EIAs (Wood, 2003). In particular, the no-action alternative is often considered an unviable alternative in most developing countries which priorities issues such as starvation and poverty (Wood, 2003). In most cases, even the environmentally preferred alternative is not considered either (Wood, 2003). Bisset (1992) also agrees that environmentally sound alternatives are rarely chosen in most developing countries. He however notes that choosing an environmentally sound option can be achieved in developing countries just like in developed countries (Bisset, 1992).

**ii) Impact Prediction**

It has been noted in literature (e.g. Lohani et al., 1997) that there is a tendency of neglecting certain impacts in development country EIAs. Scholarly works of Chadwick (2002) and Cooper and Sheate (2002) reveal that current EIA practice shows little or no consideration of social, cumulative, long term and indirect impacts, reflecting the traditional trade-offs between socio-economic gains (usually in the form of employment) and environmental degradation. The sustainable development concept aims to prevent such trade-offs (Hare, 1991). Lohani et al. (1997) also note that cumulative impacts and indirect impacts are not satisfactorily addressed in the majority of developing country EIA reports. Benson (2003) defines cumulative impacts as those impacts that arise as a result of concurrent projects or impacts that accumulate over time.

**iii) Mitigation**

It is generally presumed that implementation of proposed mitigation measures would result in protection of the environment (Tinkler, Cobb and Cashmore, 2005). Mitigation measures are perceived to be a means by which adverse impacts can be alleviated and a means for achieving the goal of sustainable development (Environmental Law Alliance Worldwide (ELAW), 2010). Glasson et al. (2005) classify mitigation goals as short term

(influencing decision making) and long term (promoting sustainable development). They further point out that the success of the long-term goal (sustainable development) depends upon the success of the short-term goal (influencing decision making) (Glasson et al., 2005). Mitigation is arguably the foundation and at the core of EIA (Wood, 2003; Tinkler et al., 2005).

The basis of this argument is the understanding that through mitigation, adverse impacts are avoided, minimised, remediated or compensated (Marshall, 2001). Some authors (e.g. Marshall, 2001; Wende, Herberg and Herzberg, 2005) contend that mitigation is a process which follows a hierarchical order of: avoidance, reduction, repair and compensation of impacts to enhance the environment. Although authors differ in opinions on what actions constitute mitigation (Gwimbi, 2014), a vast majority of literature state the three main actions of mitigation namely: avoidance, reduction and compensation.

The main focus of avoidance is to prevent environmental damage, and to ensure that environmental quality does not change from its baseline condition (Marshall, 2001). It is impossible, however, to avoid all impacts hence the existence of other mitigation measures. In cases where impacts cannot be avoided, measures that reduce the number of residual effects of development projects may be adopted (Marshall, 2001). Such measures include inter alia, introduction of new and/or efficient technology, reducing harmful practices (Marshall, 2001). Both avoidance and minimization help to ensure inter-generational equity, which is an important issue as far as sustainable development is concerned.

On the other hand, compensation encompasses restoration, relocation, enhancement and preservation (Villarroya and Puig, 2010). Gwimbi (2014) views compensation as actions of rehabilitation, restoration and reclamation. Compensation can be viewed as a means through which negative effects are turned into positive ones (Wende et al., 2005). It is thus an important determining factor of intra-generational equity in the context of sustainable development. Du Preez et al. (1997) express concern over little reference to the procedure of mitigation at the post decision stage of a project. They propounded that this often leads to decision making based on the options perceived to be the most environmentally sound, and identification of mitigation measures in the absence of

formal provision for implementation of recommendations.

#### **iv) Participation**

It is generally agreed that stakeholder involvement leads to development that delivers social and environmental gains, and curbs conflicts (Wood, 2003). In Zambia, the Environmental Management Act (EMA) states the following in part vii (section 91): ‘‘the public have the right to be informed of the intention of public authorities to make decisions affecting the environment and of available opportunities to participate in such decisions’’ (EMA, 2011).

The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured. Despite these provisions, and the gains offered by participation, many commentators believe that the current EIA practice leaves a lot to be desired. For example, (Lee, 2000) notes that consultation and stakeholder participation is deficient in many developing countries. In many developing countries, public participation in decision making is considered to be revolutionary (Wilbanks et al., 1993), and is thus excluded in some countries (Boyle, 1998 through participation, consultants also get a chance to benefit from indigenous knowledge (Appiah-Opoku, 2001).

#### **v) DECISION MAKING**

Some flaws have been reported with regard to decision making in EIA. While economic and social factors may influence decision making, corruption may also play a part in influencing decisions (Boyle, 1998; Donnelley et al., 1998). Furthermore, Mwalyosi and Hughes (1997) state that some mechanistic EIA reports produced in some developing countries have little or no effect on decisions. This problem may be attributed, in part, to the fact that environmental assessment is viewed as a constraint to investment, threatening political stability, which is dependent on economic growth (Brito and Verocai, 1999). Kakonge (1999) also notes that it is very rare for projects in African countries to be cancelled as a result of EIA.

## **vi) MONITORING**

Monitoring has been neglected in many EIA systems. Wood (1999) stresses that there is a huge gap between legislation and actual enforcement which can be attributed to a lack of funding and inadequate staff at provincial and local levels. Ultimately, authorities will have to rely on complaints from neighbours or on the credibility of developers and their consultants about non-compliance, with the latter being very unlikely (Wood, 1999). Fuggle and Rabie (2009) point out that although authorities receive complaints about non-compliance, they seldom take appropriate action to deal with the problem due to a lack of capacity or some other reasons. There is often a lack of commitment to follow-up in many EIA systems (Lohani et al., 1997). In most cases there is no assurance given as to whether conditions attached to environmental authorisation would be satisfied before development can start. Monitoring of compliance in Zambia still remains a challenge although it is covered under EMA.

Some developers in developing countries have a tendency of making alterations to the project once it has been authorised, and in most cases environmental controls may not be monitored or observed (Wood, 2003). Some authors (e.g. Biswas, 1992) suggest that this challenge could be alleviated if compliance monitoring is made a condition of assistance. George (2000) suggests that environmental management systems like ISO 14001 be implemented to avoid or minimise negative impacts of projects. However, Wood (2003) acknowledges that implementation of monitoring measures can be costly. George (2000) suggests that where financial constraints exist, resources should be channeled towards those impacts deemed to be the most significant.

### **2.5 EIA and Sustainable Development**

According to the World Commission on Environment and Development (1987), “sustainable development is development which seeks to meet the needs and aspirations of the present without compromising the ability to meet those needs of the future”. It encompasses three pillars namely: economic, environment and society. The economic component seeks to efficiently manage the economy to meet material needs, while the environmental component is concerned with the conservation and enhancement of the physical and biological resource base and ecosystems. The social pillar, on the other hand refers to meeting the basic needs of society (UNDESA, 2002). Sustainable development, therefore, provides a framework for managing human and economic

development while ensuring a proper and optimal functioning natural environment.

Ideally, the purpose of implementing mitigation measures is to ensure that negative impacts of development projects are avoided, minimised or compensated (Glasson et al., 2005). As such, mitigation can be viewed as key to sustainable development. The general consensus among EIA researchers is that proper EIA has the potential to minimise environmental impacts by identifying them and suggesting possible ways to mitigate those impacts (Gwimbi, 2014). Ultimately, EIA assists in contribution towards sustainable development (Glasson et al., 1999). Rhodes (2012) concurs with the above statement, noting that EIA is an internationally recognised process which could aid in achieving the goal of sustainable development.

While EIA is recognised as a useful tool which provides recommendations for the mitigation of negative environmental impacts, questions are being raised on the effectiveness of the EIA system in most developing countries. Coetzee and Morris (2013) stress that the current EIAs are mainly done in line with procedural and reporting requirements as per EIA regulations, and do not focus on sustainability issues. They also note a lack of trade-off rules and denotative decision-making criteria to uphold the sustainable development goal. Another potential explanation for the limitation of EIA in its contribution towards sustainable development is the unavailability of a “unique” definition of the concept of sustainable development (O’Riordan, 2000).

However, the general consensus is that sustainable development is based on three pillars, i.e. ecological, social and economic pillars, popularly known as the “triple bottom-line” approach (Goodland and Daly, 1996). Furthermore, to assess EIA effectiveness, a lot of information needs to be gathered, which in most cases is not available due to a host of reasons (Fuggle and Rabie, 2009). Fuggle and Rabie (2009) also point out that little empirical data has been collected as a result of low levels of EIA follow-up, enforcement and compliance monitoring. One potential reason for this shortcoming could be a lack of manpower (Fuggle and Rabie, 2009). Wood (2003) stresses that despite EIA being generally regarded as an important tool in making decisions on issues affecting the environment, it seems to marginally serve its intended purpose.

## **2.6 The Effectiveness of EIA**

In view of different backgrounds of different authors contributing to the effectiveness debate, it's difficult to arrive at the definition of effectiveness (Baker and McLelland, 2003). According to these authors, the absence of a universal definition makes it further difficult to determine and judge the effectiveness of any EIA system. However, despite these challenges, some progress has been made in defining EIA effectiveness. Effectiveness of Environmental Assessment could be defined as the degree to which EIA has been successful in meeting its objectives and purpose, that is meeting the aims of EIA and reasons for which it is conducted, respectively (Jay et al, 2007). In the impact assessment field, Sadler (1996:37) defined effectiveness as “how well something works or whether it works as intended and meets the purposes for which it is designed”. In addition, the effectiveness of impact assessment tools has been considered their influence on decision-making processes in selecting the most appropriate option for the development, based on sustainability measures (Partidário, 2000, Van Buuren and Nootboom, 2009).

However, the extent of their influence to contribute to the decision could rely on effectiveness perspectives and the context where the implemented tools are applied. Saddler in Theophilou et al (2010) further identified three types of effectiveness in EIA, namely; procedural, substantive and transactive. According to Theophilou et al, (2010) procedural effectiveness evaluates whether the EIA process has been undertaken according to established expectations. Rhodes (2012) further highlights factors that generally influence the procedural effectiveness of EIA as legislation, administrative structures, economic and financial arrangements, political structures and processes. Ingram et al in Rhodes (2012) also argue that public and opinions of the public, interested groups, as well as the orientation of the public officials are also critical to the procedural effectiveness of EIA.

Some of these theoretical perspectives include institutional frameworks, which suggest that EIAs effectiveness is affected by institutional behaviour such as governance and public participation (Vog, 2008). Others have advanced the argument that, lack of ownership (Stoeglehner et al, 2009) and embeddedness (van Buuren and Nootboom, 2009) may explain problems associated with effectiveness in impact assessment. The

main issue is that, the introduction of impact assessment has rarely been accompanied by capacity development, necessary to prevent it from being manipulated.

Kolhoff (2008) and others have argued that, EIAs are effective in developed countries and limited in effectiveness in developing countries, leading to the conclusion that, the country specific context has greater influence on the performance of the EIA system. While this is an interesting argument, it assumes that EIA is effective in all developed countries and less effective in all developing countries, thus ignoring for example, the reality in the implementation of the tool, diversity and historical context in how EIAs have been adopted in different countries. This argument also ignores the fact that, the EIA process is a universal procedure that calls for having some generic criteria and conditions in place, in order to make it work. Individual countries specific context needs to be adapted to the universality of the EIA process to give it meaning, so that practitioners all over the world, are able to conclude that an EIA process in a certain country is effective and useful or not.

Substantive effectiveness assesses whether the EIA process is achieving its goals, such as informing the decision making and contributing to environmental protection (Theophilou et al, 2010). Rhodes (2012), who emphasises that substantive outcomes focus on whether the goals of EIA were delivered after the project had been implemented, echoes this view. Several authors have discussed various perspectives on what effectiveness is or what it should focus on (Cashmore et al, 2009; Elling, 2009). What is involved to achieve effectiveness is also a contested and contextual issue, suggesting lack of consensus in the literature about what effectiveness ought to be.

In this research, the perspective of effectiveness as proposed by Elling (2009) is adopted. Elling notes that effectiveness in environmental assessment means setting the right targets and meeting them with the right means, in the process of implementing a project or plan with environmental caretaking. To him, effectiveness refers to the outcome of the effects to implement the project and to protect the environment, namely to meeting established targets - targets for the process as such or targets for the environmental outcome from it (Elling, 2009). Targets may vary from one country to another, but it is generally recognized by several EIA practitioners, that the main purpose of an EIA is to

enable decision makers make informed and appropriate decisions on the proposed project, so that environmental issues are minimized through planned environmental and social management actions. In order to meet those targets, it is important for an EIA process to define the objectives of undertaking EIA and the means and criteria of meeting those objectives.

These means and criteria are explained in various ways including policies, legal frameworks, institutional arrangements and the necessary steps. However, it is also important to note that environmental impact assessments are conducted within specific sociological and cultural contexts, which will influence their outcome and effectiveness. Therefore, it is crucial to reflect not only on procedures, but also on institutional capacity, norms and culture (Cashmore et al, 2009) that will be upheld in order to make this process effective. Norms and culture in their broad sense would include not only professional ethics for environmental assessments but also, the recognition and respect for the rule of laws, procedures and the values and relationships that support those systems. The recognition of, respect for rules norms and to ensure that these are implemented accordingly is a crucial component of the accountability processes.

EIA effectiveness in this research was measured in terms of the extent development activities that require EIAs, are actually subjected to this process prior to their start. It is recognized that, just by having a project subjected to EIA is not enough to make the EIA process effective, however, it is a crucial first step in the process of ensuring compliance to the laws. In this research, factors such as institutional frameworks, legal regimes, stakeholder participation and capacity development are important but not sufficient to explain EIA effectiveness. Governance issues such as accountability provide additional explanations, as to why some EIA system in a particular context is not effective. Transactive, EIA effectiveness examines whether the EIA process delivered the outcomes at the least cost and minimum time possible (Theophilou et al, 2010).

According to several authors, EIA effectiveness is embedded in the definition of EIA that is either to bring about a change towards a more sustainable option or to follow a rigorous process with legally binding steps, or both. The rationality issue of EIA effectiveness is seen from the understanding that EIA should produce information for

decision-making. Information is collected during the drafting of an Environmental Impact Statement (EIS) and presented in public hearings and consultations, and the competent authority evaluates its validity. Elling (2008) argues that the presentation of better information will lead to better decisions, which will be appropriate to environmental protection or enhancement when approved development takes place.

The effect of EIA on decision-making is in fact a key component of EIA effectiveness. According to the EU directives, the results of environmental assessment have to be considered in decision-making. However, there are different views among researchers and practitioners regarding how the consideration of gathered information and results of public consultations should be implemented. Elling (2008) in his fundamental piece of work on decision making in environmental process is of the view that EIA provides a kind of platform for communication among the stakeholders, which must be oriented towards mutual understanding, and provide a solution.

The latter is a political process and is not the one that decides upon a proposal, but one that draws up a solution. In Elling's view, the construction of a solution must occur in a political process following after and clearly detached from the reflexive process. Elling further argues that the political decision makers are not bound by the Environmental Impact Statement, but solely by their own convictions, admitting that when publishing a solution, which they have reached, they have to explain how the environmental impact stated in the EIS has shaped their decision.

For instance, decision makers must give reasons why they accept one environmental effect rather than another, why they choose to overlook an assumed effect, how they balance the values at play against each other, and what their environmental objective is behind the decision. The reason for separating the two processes, which Elling (2009) calls reflexive process built on communicative reason and a political decision-making process built on a power-based compromise, is to ensure that the public and the politicians are fully aware of all information available on environmental effects, uncertainties, margins of error etc. before politicians work out a solution and produce an outcome.

Moreover, Therivel et al. (2009) demonstrated that EIA does not necessarily ensure high protection of the environment. According to the study results, the local authority planners felt that the process favoured economic and socio-economic factors rather than environmental factors. This trend is very common in developing countries. While Elling (2009) expects the decision makers to explain how they came to the solution, (Therivel et al 2009) have demonstrated that decision makers do not explain how or why these trade-offs are made, and do not justify why the environmental protection is not achieved. However, authors increasingly argue that decision-making is not rational, and that EIA has considerably more roles than simply the provision of information (Morrison-Saunders & Bailey, 2009).

There is a growing consensus that timely and broad-based stakeholder involvement is a vital ingredient for effective EIA and development in general. The World Bank has found that public participation in EIA tends to improve project design, environmental soundness and social acceptability (Mutemba, 1996). Mwalyosi and Hughes (1998) identified a similar experience in Tanzania. They found that EIAs that successfully involved a broad range of stakeholders tended to lead to more influential environmental assessment processes and consequently to development that delivered more environmental and social benefits. Conversely, EIAs that tended to have less influence tended to have less influence over planning and implementation, and resulted in higher social and environmental costs.

In fact, placing sufficient emphasis on stakeholder involvement in the EIA process can improve the predictive quality of environmental assessments. This is because the prediction of impacts using EIA often requires information and quality baseline data. Yet one of the commonest problems with environmental assessments is that time and financial limitations, constrain the collection of such data. Hence predictions are often based on a picture which can be misleading or inaccurate. Scholars such as Glasson (1999) and Sadler (1996) strongly believe that assessments that involve different stakeholder groups, including those in local communities, have greater potential to access a wider information resource base and in some cases, generations of cumulative knowledge of their local environment.

## **2.7 Effectiveness and Quality of EIA Reports**

The function of the EIA report is to help the responsible authority in making informed decisions, the public in understanding the likely impacts of the proposal, and the proponent in managing these impacts (UNEP, 2002). Therefore, the quality of the EIA report is of particular importance among all the aspects that the overall effectiveness of EIA depends. It is the fundamental indicator of the effectiveness of EIA since the information presented in the report reflects the technical and scientific quality of the EIA process (Modak & Biswas, 1999; Pinho et al, 2007).

The EIA report is the final outcome of the EIA process; hence it should include all the necessary environmental information related to a project and decision-making (Glasson et al, 2005; Wood, 2003). The target audience of the EIA report consists of a non-technical component, represented by decision-makers and members of the public, and a technical component represented by specialists in government bodies, NGOs and other expert groups (Canter, 1996). The EIA report should therefore be clearly communicated in plain, non-technical language which is accessible to the non-specialist, project specific and of direct relevance to the decision- maker (DEAT, 2004). For the EIA to meet its purpose, it is important for the report to be of good quality. Glasson et al (2005) highlighted production of poor-quality EIA reports as a weakness of current practice.

Research into the quality of EIA reports, particularly in developing countries reveals that there are some areas which could benefit from improvements. These include description of the development and baseline studies, identification of impacts, assessment of impact significance, consideration of alternatives, mitigation of impacts, public participation, monitoring and post auditing (Jalava, Pasanen, Saalasti & Kuitunen, 2010; Kruger & Chapman, 2005; Mhango, 2005; Peterson, 2010; Sandham, Moloto & Retief 2008; Sandham & Pretorius, 2008). However, EIA quality studies have shown that overall quality of EIA reports have often improved with time (see Glasson et al, 2005; Kabir, Momtaz & Gladstone, 2008; Sandham & Pretorius, 2008).

## **2.8 Evaluation and Review of EIA Reports**

EIA report review is the principal quality control function within any EIA system (Pretorius, 2006). Review is the evaluating of documentation to determine its adequacy

for consultation and decision-making (Lee & George, 2000). The purpose of review is to assure the completeness and quality of information gathered in an EIA. The key objectives of EIA review (UNEP, 2002) are to assess the adequacy and quality of an EIA report, take account of public comments, determine if the information is sufficient for a final decision to be made, and to identify as necessary, the deficiencies that must be addressed before the report can be submitted.

The quality review of the EIA report involves evaluating how well a number of assessment tasks have been performed (Lee & George, 2000). The elements of EIA review and the aspects considered differ with arrangements that are in place in a particular country. Reviews must establish a set of quality criteria to be met as well as a minimum standard for achieving these (Pretorius, 2006). A review of the EIA report should not just be a matter of checking that required information is presented. It should also consider the quality and success of the whole EIA process (Jalava et al, 2010).

## **2.9 Existing Review Packages**

A large number of guidance documents and sets of criteria have been developed around the world to assist in assessing the adequacy and quality of EIA reports. Examples include the Lee & Colley review package (Lee et al, 1999), the European Commission (EC) criteria (2001), the Oxford Brookes University review package (1996), Sandham & Pretorius (2008) and Sandham, Moloto & Retief (2008). All of these packages draw on international practice, and provide valuable insights into the scope of information and considerations that should be included in EIA reports, and set high standards for the contents of EIA reports (Simpson, 2001).

The criteria often reflect the regulatory requirements and the set of objectives of EIA with the aim to ensure that the reviewer focuses on appropriate issues (Jalava et al, 2010). Some of the packages are discussed below.

### **2.9.1 The European Commission Guidelines on EIS Review**

This Guideline is designed to be used to assess the quality of EIA report across European Union member states. The EC Guidelines consist of a checklist with 143 review questions divided into seven sections which may contain subsections (Table 2.1). The checklist could also allow the possibility for comparing the results with similar studies

(EC, 2001).

### **2.9.2 The Lee & Colley Review Package**

The Lee & Colley review package was developed for the review of EIA reports in the UK (Lee et al, 1999). This package had been widely used to undertake reviews of project level EIA reports. It consists of multiple criteria arranged in a four-level hierarchical structure consisting of an overall report grade, review areas, which are used to assess the quality of EIA reports.

The review topics are hierarchically arranged under four review areas and these are, Description of the development, the local environment and the baseline conditions, Identification and evaluation of key impacts, Alternatives and mitigation, and Communication of results. The quality review involves evaluating how well a number of assessment tasks have been performed.

The structural and methodological clarity of the Lee & Colley review package, and its comprehensive scope and familiarity to many professionals in the field of project level EIA makes it a natural choice for adaptation for use with EIA reports (Simpson, 2001). This review package has been developed and adapted to the EIA procedures of many countries (Lee et al, 1999; Mwalyosi & Hughes, 1998; Sandham et al, 2005; Sandham & Pretorius, 2008; Simpson, 2001). This shows that the Lee & Colley review package is one of the better review packages developed (Lee et al, 1999).

### **2.9.3 The Oxford-Brookes University Review Package**

This review package is an amalgamation and extension of Lee & Colley's and the EC's criteria developed by the Impacts Assessment Unit at the Oxford Brookes University and funded by the Department of Environment of the Scottish and Welsh Offices in 1995-96 (Glasson et al, 2005). The package is better known as the Impact Assessment Unit (IAU) review package. The IAU review package was developed for a research project into the changing quality of EISs. The package is a robust mechanism for systematically reviewing the EIA report. The package includes 92 criteria and not all the criteria are relevant to all projects.

### **2.9.4 The EIS Report Checklist for Zambia**

The EIS Review checklist points for Zambia are grouped into nine headings. These are; General information about the proposed project, EIA procedure (this includes the public hearing process and comments from the interested and affected parties (I & APs), Land-use and physical information , Biophysical information, Demographic information, Socio- economic information, Significant environmental impacts, Mitigation measures (Environmental Management Plan (EMP)) , Comparison with guidelines and standards should be made as well as reference to the drafted conditions for how ZEMA deems the development should operate in order to comply with Zambia's EIA regulations.

This is a one level review checklist for reviewing the completeness of an EIA. This review checklist is hardly effective in reviewing the quality of information that is presented. As Jalava et al (2010) argues an EIS review should not just be a matter of checking that required information is presented but should also consider the quality and success of the whole EIA process.

## **2.10 The EIA System in Developing Countries Before 2000**

Before 2000 EIA was still in an early stage and it was not long since EIA became legislated in developing countries. Institutional problems were the most important barriers to the effective implementation of EIA (Lim, 1985). EIA agencies usually lacked sufficient resources or political power, and EIA had little influence on planning and decision making in the Philippines (Abracosa & Ortolano 1987). Legislation, administration, and enforcement were priority issues to be addressed to make EIA more effective (Brown et al., 1991).

An EIA agency could not enforce governmental agencies to implement mitigation measures; the perception of EIA held by decision makers was not well developed; and EIA regulations did not contain appropriate stages of public participation in Thailand (Tongcumpou & Harvey 1994). In Asia the relatively low status of EIA agencies in bureaucracy made it difficult for them to have sufficient influence to ensure the effective implementation of the EIA process. Strengthening legislation and administration was a priority for the implementation of EIA and this required many items, including the promulgation of regulations, the organization of new institutions, the definition of appropriate conditions for the issuance of licenses, setting of

environmental quality standards, recruitment and training of personnel, provision of material means and equipment, and the allocation of appropriate budgets (Lohani et al., 1997).

The other issues such as capacity building, public involvement, monitoring, and consideration of alternatives cannot be solved without adequate legal frameworks and administration. Lack of a legal framework and inadequate government capacity are concrete constraints for public participation (Kakonge, 1996). Project proponents have no budget for implementing the mitigation measures and monitoring programs (Brown et al., 1991). The limitation in the consideration of alternatives was related to political constraints (Lim, 1985). EIA was conducted at the latest project plan stage and there was little or no opportunity to consider alternatives (Nor, 1991).

### **2.11 The EIA System in Developing Countries After 2000**

After 2000 many developing countries strengthened their EIA legislation. Malaysia, Turkey, and Thailand implemented EIA systems between the late 1970s and the 1980s, and have more than 30 years of experience in EIA practices. EIA legislation was introduced in Malaysia in 1987 and much progress has been made in enforcing compliance with the requirements (Briffett et al. 2004). The strength of the Turkey legal and institutional structure makes the EIA system strong as a whole (Coşkun & Turker, 2011).

The Thai EIA system has clear procedures and its EIA reports are available online as a database (Suwanteep et al., 2016). Thus, the constraints and recommendation after 2000 are different from those before 2000. The appearance ratio of report quality as a constraint has nearly doubled. An effective EIA consists of; adequate institutional arrangements, the good quality EIS, and implementation of mitigation measures (Ortolano et al., 1987; Sadler, 1996; Momtaz & Kabir, 2013).

The developing countries may come to the second stage to improve the quality of their EIS after adequate institutional arrangements are developed. The appearance ratios of capacity building and public involvement in recommendations show a large increase after 2000. After a legal framework is prepared, capacity building and public

involvement are ready to be improved, and they become more important after rather than before 2000. Failure of EIA in developing countries is often linked more to a lack of effective implementation through lack of capacity rather than serious imperfections in the EIA process (Alshuwaikhat, 2005). For instance, the EIA regulations of public participation in Kenya are good but the practice is poor (Okello et al., 2009).

Likewise, despite major improvements to the policy and legislative framework, a significant gap between theory and practice of EIA remains in Vietnam (Clausen et al., 2011). And, even though the legislative provisions and guidelines for EIA are quite comprehensive in India, low levels of implementation of the mandatory requirements for EIA is resulting in the development and operation of many environmentally unsound projects (Panigrahi & Amirapu, 2012). The differences between constraints and recommendations of monitoring, information, and alternative become larger than before 2000. Their needs are growing, but their implementation still faces difficulties.

Adequate legal and institutional frameworks and capacity building to address them are still weak. For example, the consideration of alternatives is still absent from China's EIA system (Wang et al. 2003). Baseline data and information on the environment are missing or outdated due to limited resources in Ethiopia (Ruffieis et al., 2010), and a weakness remains in the legislation in Vietnam; there is no requirement for ongoing monitoring during project operation (Clausen et al., 2011). The legal infrastructure for EIA procedures is strong in Turkey, but the assessment of alternatives and the lack of public participation and environmental databases are weak points (Coşkun & Turker, 2011). Similarly, the EIA system in the United Arab Emirates requires alternatives assessment and monitoring during construction and operation, but a full consideration of alternatives is not always evident and not all projects conduct monitoring (Heaton & Burns, 2014).

## **2.12 Improving the Quality of EIS Using Statistical Analysis**

Previous studies reviewed the quality of EIS based on the Lee-Colley method (Lee & Colley 1990; Lee & Colley 1992; Lee et al., 1999), and showed the portion of quality grades that were satisfactory and unsatisfactory. They then went on to discuss improvements in quality based on the portion of satisfactory and unsatisfactory.

They did not use statistical analysis to find determination factors influencing EIS quality (Cashmore et al., 2002; Canelas et al., 2005; Sandham & Pretorius, 2008; Badr et al., 2011; Momtaz & Kabir, 2013; Sandham et al., 2013). Experience and project size are the main factors influencing quality because the input quantity of funding and human resources is different. Little is known about determination factors other than the difference in input quantity for improving EIS quality. One reason is that the statistical analysis of quality grade data has not been utilized, and recommendations to improve quality are little in evidence. The statistical analysis of quality grade data could identify the determination factors influencing EIS quality, and enable the classification of satisfactory and unsatisfactory grades (Kamijo & Huang, 2016).

For example, the consideration of alternatives is hardly focused on as a recommendation to the EIA system, or a factor influencing EIS quality, in previous studies. But alternatives analysis and public involvement have been shown to be effective in improving the quality of EIA reports. The effectiveness of a linkage between alternatives analysis and public involvement is thus emphasized.

However, there have been few studies focused on that linkage. This new finding is based on statistical analysis (statistical test and path analysis with structural equation modeling). The statistical analysis is very useful tool for finding and verifying determination factors for improving the quality of EIS (Kamijo & Huang, 2016).

### **2.13 Gaps in Knowledge**

This chapter presented scholarly works relevant to the issues under investigation. The review of literature helped the researcher to develop the questionnaires used to gather data for this study. There is a wealth of international literature and literature on EIA effectiveness in general. A majority of the literature covers EIA in general. However, there is limited literature focusing on the effectiveness of EIA in the manufacturing sector of Zambia. This provides a justification for conducting this study. Building on from the literature cited in this chapter, the chapter that follows presents the methodology employed to conduct this study.

## **2.14 Chapter Summary**

The chapter provided a review of literature on the effectiveness of EIA practice and the techniques used to evaluate the EIA reports to establish the effectiveness of the EIA practice. The chapter begun with a brief discussion on the concept of EIA and its purpose, followed by a brief discussion on EIA effectiveness, the quality of reports and on the existing review packages that were developed for reviewing the quality of EIA reports over the world. Then literature on EIA in developing countries is explored. Furthermore, the literature about EIA discussed in this chapter helped the researcher to discuss the findings of the study.

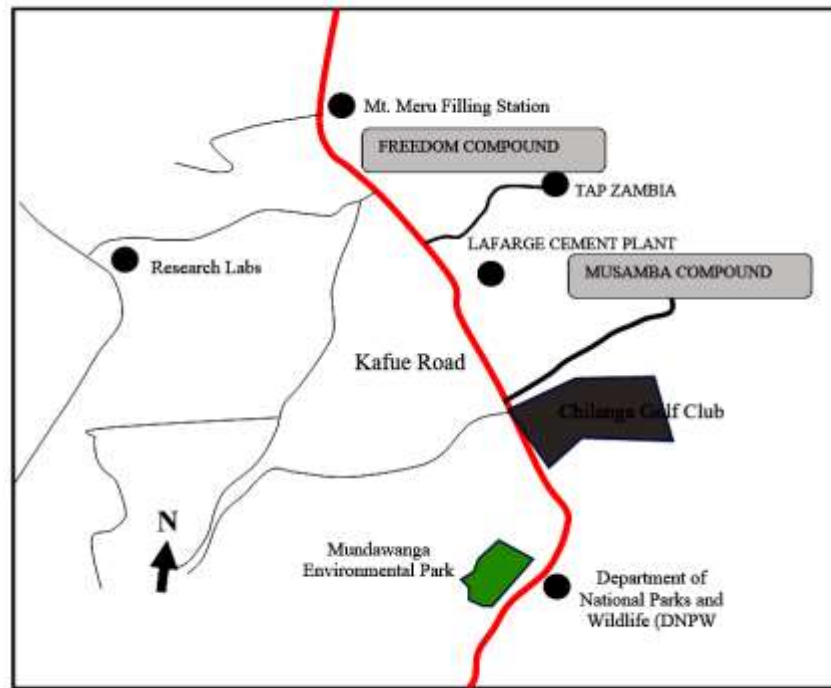
## CHAPTER THREE: METHODOLOGY

### 3.1 Overview

This chapter discusses the methodological approaches which the study employed. The chapter, therefore, has been divided into the following sub-headings: location of the study, research paradigm, research design data collection, sampling techniques and analysis of data.

### 3.2 Location of the Study Area

The Chilanga cement plant lies along the Lusaka-Kafue Road in the Chilanga Township of Chilanga district, about 16 km from the Central Business District of the City of Lusaka. The plant is located between 28°16' and 28°17' East and 15°32' and 15°33' South. The areas surrounding the plant are developed, with permanent settlements such as Freedom Compound and Musamba Township. Industrial developments around the plant include TAP Cement Zambia on the north-eastern side. There are private farms on the western and northern side while the southern part is bordered by Chilanga Golf Course, commercial and residential developments (Lafarge Cement Plan EIA, 2008). Figure 2 show the location of Chilanga Cement plant.



*Figure 2: Map showing the location of the Lafarge (Chilanga) Cement Plant.*

(Source: Adapted from Lafarge Cement Plant, 2023).

### **3.3 Research Design**

The study employed a mixed methods approach. Within this framework an embedded research design was adopted in which the researcher collected and analysed both qualitative and quantitative types of data at the same time. The qualitative data was embedded in the quantitative data in the interpretation of the overall results.

### **3.4 Research Paradigm**

Pragmatism as a research paradigm finds its philosophical foundation in the historical contributions of the philosophy of pragmatism (Maxcy, 2003) and, as such, embraces plurality of methods. As a research paradigm, pragmatism is based on the proposition that researchers should use the philosophical or methodological approach that works best for the particular research problem that is being investigated (Tashakkori & Teddlie 1998). It is often associated with mixed-methods or multiple-methods (Biesta, 2010; Creswell, 2011), where the focus is on the consequences of research and on the research questions rather than on the methods.

The study sought the opinions of the study subjects on the effectiveness of EIA in promoting sustainable development, and make recommendations on how the system can be improved, based on the analysis of the current situation.

### **3.5 Data Collection**

To carry out this evaluation, a two-pronged approach was adopted, namely; a desk study consisting of a review of relevant documentation; and semi-structured interviews with key stakeholders involved in the EIA process. The desk study approach will firstly assess the manner in which EIA process is implemented at the Chilanga cement plant.

#### **3.5.1. Primary Data**

Primary data were collected using in-depth interviews and questionnaires. It was collected from respondents' words in the context of the research problem (Holloway & Wheeler, 2002, p. 8). This approach allowed greater latitude in providing answers which led to respondents providing in-depth information regarding the topic at hand.

### **3.5.2. Interviews**

Interviews (Appendix 3 & 4) were conducted with EIA practitioners at ZEMA, Chilanga Cement plant, and Lusaka City Council. This is because these practitioners were the custodians of information with regards to EIA practice. The interviews were used as they provided flexibility and a relatively open approach. This allowed the researcher to adjust the direction of the interview were necessary.

A total of eighty (80) household interviews were conducted, forty-five (45) of which were with residents of Musamba community and thirty-five (35) were with residents of Freedom community. Key informants interviewed were ten (10) officials from ZEMA, ten (10) factory inspectors from Chilanga Cement plant and two (2) workers from Lusaka City Council. Interviews were carried out with EIA officials from ZEMA and other stakeholders to provide information on the status of environmental legislation in Zambia, the quality of EIA reports and to identify factors that influence the quality of EIAs.

### **3.5.3. Questionnaires**

Questionnaires (Appendix 1 & 2) were used to collect qualitative data from the factory inspectors from Chilanga Cement plant, EIA practitioners from ZEMA, and EIA practitioners Lusaka City Council on mitigation measures and the challenges in implementing mitigation measures. Questionnaires were used because they offered fast, efficient and inexpensive means of gathering large amounts of information from sizeable sample sizes. Their use of open and closed research questions enabled the researcher to obtain both qualitative and quantitative data, resulting in more comprehensive results.

### **3.6. Measurements for Particulate Emission and Observations**

Measurements for particulate emission rates were carried out at all stacks with sampling ports located at recommended heights. The STL combi dust sampler was used for isokinetic dust sampling to determine dust loading in the stacks off gases. The gaseous pollutants in the off gases were measured using the Testo 350 Gas analyser to determine the concentration of Sulphur dioxide, carbon monoxide, nitrous oxide and other pollutants. Observations were also used to assess the aspect of the company's

commitment to suppressing dust emissions.

### **3.7 Secondary Data**

Several documents including the relevant legislations, policies and laws governing the EIA process in Zambia were reviewed. These documents were accessed from the ZEMA library and online sources. A review of the Chilanga Cement Plant EIA report was made using the Lee and Colley review criteria. A range of documents were reviewed to gain more insight into the study at hand. These included the Chilanga EIA report, Zambia's EIA procedural report and the reports on emission levels from the plant. This data was used to compare the old Chilanga plant and the New Chilanga plant with regards to emission levels.

### **3.8 Sampling Techniques**

The sampling techniques involved interval sampling and homogenous purposive sampling. All the respondents were given pseudo names. These respondents were selected because they were responsible for reviewing reports after submission and were in a position to provide additional information on the quality of EIA reports in Zambia.

#### **3.8.1. Interval Sampling**

The type of settlement pattern in Musamba and Freedom compounds is clustered. Interval sampling was used when conducting in-depth interviews with the community members in Musamba and Freedom compounds. There are 480 households in Musamba compound and 650 households in Freedom compound (Central Statistics Office, 2020). In Musamba community, the researcher interviewed one person from every 3rd household while in Freedom, the researcher interviewed one person from every 5th household. The sampling interval was achieved by dividing the number of households in a compound by the desired sample size, which is 45 households for Musamba compound and 35 for Freedom compound.

#### **3.8.2. Homogenous Purposive Sampling**

Homogenous purposive sampling was used because it recruits a very narrowly defined subpopulation, producing a sample with uniform traits (Patton, 2002). The researcher used this sampling technique to understand a particular group of respondents based on their job types. This was in order to get right-hand information from key informants.

This involved interviewing officials from ZEMA, Chilanga Cement plant and environmental consultants from Lusaka City Council.

### **3.9 Ethical Considerations**

The study attempted to stick to the following ethical principles: it respected the rights of individuals to privacy, confidentiality, self-determination, and autonomy. The study also attempted to safeguard individuals' identity and data collected would be treated with confidentiality. First and foremost, the study ensured informed consent of respondents through their respective establishments at Chilanga Cement, ZEMA and Lusaka City Council.

### **3.10 Delimitation of the Study**

In order to determine and manage the delimitation of the study, certain research boundaries were established. The researcher did not include Zambezi Portland Cement and Dangote Cement in the study but limited the study to the Chilanga Cement plant who's EIA procedural documents were completed and approved by ZEMA. Chilanga was chosen because there had been an outcry from the residents concerning the dust emissions in Chilanga. Permission for reviewing the Chilanga EIA report was requested from UNZA (see Appendix 5). This allowed for EIA practitioners and factory inspectors to give the necessary information to the researcher.

### **3.11 Limitations of the Study**

The research encountered a number of limitations. One such limitation was on how to access statistics on levels of pollution from the plant since the EIA was conducted. However, ZEMA gave the researcher access based on the fact that the information was purely for academic purposes.

Another problem was the refusal of a number of environmental officers from Chilanga Cement to be interviewed, as well as the slow rate of response of others who did eventually agree to be interviewed. Some respondents who declined to be interviewed eventually provided suggestions as to others, who might be willing to participate, but such referrals took time; several of them also turned out to be nonproductive. Furthermore, (public sector employees) failed to give adequate feedback on specific

information. Nevertheless, in spite of these limitations, the data gathered was significantly important and gave an added insight to the dissertation.

### **3.12 Credibility and Trustworthiness**

According to Norman et al., (2020) Credibility asks the “how congruent are the findings with reality?” It involves the construction on the part of the reporter and the subsequent readers. This research was guided by credibility through the various processes of triangulation.

### **3.13 Validity and Reliability**

Whereas validity means “how well an idea about reality ‘fits’ with actual reality” and can be described as a “bridge between a construct and the data”, reliability in the context of research refers to the dependability and consistency of study outcomes which means that the same findings and conclusions can be achieved if another researcher follows the same procedures of an earlier study and conducts the same study all over again (Neuman, 2007, pp. 115, 120; Yin, 1994).

Validity was therefore achieved through the use of open-ended, unstructured interviews with the chosen participants. This enhanced a clearer and better analysis of data. This research created a chain of evidence using different forms of information (e.g., documents, records, and observations) and, finally, allowed the researcher to review the Chilanga EIA report. While conducting this study, several sources of evidence and employees were asked to fill in the study’s questionnaire and deliver their personal and individual answers. In order to meet the chain of evidence criteria different sources were used: one personal interview, documents and a questionnaire.

### **3.14 Data Analysis**

The study followed content analysis as the principal technique to analyse the data. Content analysis is defined as “a research technique for objective, systematic and quantitative description of the noticeable content of communication” (Asgedom, 1998). This method was chosen because it is flexible for identifying, describing and interpreting patterns within a data set in great detail (Clarke, 2006). The research picked on the inductive approach which allowed for the data to be coded without fitting the

themes into pre-existing coding frames or the researcher's perceptions about the research (Clarke, 2006). This allowed for themes to emerge through the data itself. For the qualitative component, the data was reduced to themes that captured the narratives available in the account of data sets. The researcher, in the first place, transcribed the interviews and questionnaires to provide a complete record of the discussion. The data was then coded and fitted into emerging themes.

For quantitative data, descriptive statistical analysis was used to formulate tables and charts on data from questionnaires. The researcher then organised the data, searched for patterns to identify what was important information to be recorded. Quantitative and qualitative data was then synthesised and integrated to produce data to address the objectives.

### **3.15 The Lee and Colley Review Package (1999)**

The review of the EIA report was done against the Lee and Colley Review Package (Lee & Colley, 1992) established in the United Kingdom. The review package has been extensively used in past studies (Sandham et al., 2008). The successful use of this package worldwide, and its quick and easy to understand structure and methodology are the reasons why it was adopted in this study.

The Lee and Colley review criteria was administered on the EIA report for the Chilanga Cement plant. It consists of multiple criteria arranged in a four-level hierarchical structure consisting of an overall report grade, review areas, categories and sub-categories, which were used to assess the quality of EIA reports (Lee et al., 1999). The four-level structure includes the following:

- i. evaluation of the baseline information and description of the local environment in the EIA report;
- ii. review of the robustness of the identified impacts and risks of the environmental impacts of the project;
- iii. evaluation of the alternatives and mitigation measures against international standards; and
- iv. Communication of results.

The quality review involved evaluating how well a number of assessment tasks were performed. Then drawing upon these assessments, the researcher progressed upwards from one level to another, applying more complex criteria to broader tasks and procedures in the process until the overall assessment of the EIA report was completed. The assessment from applying each criterion was recorded on a collation sheet using a standard list of assessment symbols. The symbols A-C represent generally satisfactory performance and D-F generally unsatisfactory performance at each of the levels in the review hierarchy (Table 1).

**Table 1: Assessment symbols of the Lee and Colley Review Package.**

<b>Rating</b>	<b>Explanation</b>
<b>A</b>	Generally well performed, no important tasks left incomplete
<b>B</b>	Generally satisfactory and complete, only minor omissions and inadequacies
<b>C</b>	Can be considered just satisfactory despite omissions and or inadequacies
<b>D</b>	Parts are well attempted but must, as a whole be considered just unsatisfactory because of omissions or inadequacies
<b>E</b>	Not satisfactory, significant omissions or inadequacies
<b>F</b>	Very unsatisfactory, important tasks(s) poorly done or not attempted
<b>N/A</b>	Not applicable. The review topic is irrelevant in the context of this EIA report

(Source: Assessment symbols of the Lee & Colley Review Package (Lee et al, 1999))

The structural and methodological clarity of the Lee and Colley Review Package, and its comprehensive scope and familiarity to many professionals in the field of project level EIA makes it a natural choice for adaptation for use with EIA reports.

### **3.16 Chapter Summary**

To achieve the aim of this study, it required using appropriate methods of collecting and analysing data. In addition, the geographical location, the data collection strategies, sampling methods and observations were appropriate for this study. The research design and methods illustrate the use of both qualitative and quantitative data collection and analyzing methods.

## CHAPTER FOUR: RESULTS AND DISCUSSION

### 4.1 Overview

This chapter presents the results of the study and also the discussion of the results. The areas covered are the operations at the old and the new Chilanga Cement plants, performance of the two plants, comparison of Zambia's EIA against international standards, and the quality of the EIA report.

### 4.2 Conformity of the Chilanga EIA to International Standards

International standards are guidelines and principles that help harmonize the EIA process across different countries and contexts. By following international standards, you can ensure that your EIA process is consistent, transparent, and accountable, and that it addresses the most relevant environmental and social impacts of your projects. Conformity to international standards maybe achieved through a review of the EIA report as it contains all the relevant information with regards to the plant. The Chilanga EIA report was reviewed using the Lee & Colley review package.

#### The Chilanga Cement Plant EIA Report Review

This review area gives a holistic picture of the development within an existing environment and the baseline conditions so as to predict, analyse and assess all possible impacts efficiently. The assessment symbols for the review topics are presented in Table 2 and the results for Review Area 1 are presented in the Table 2.

**Table 2: Assessment symbols for review topics.**

<b>Symbols</b>	<b>Description of the Ranking system</b>
A	Task well performed, no omissions, or inadequacies
B	Mostly satisfactory and complete, with minor omissions or inadequacies
C	Can be considered satisfactory and complete, with omissions and inadequacies
D	Certain sections were well attempted, nonetheless must be considered unsatisfactory due to omissions and inadequacies
E	Not satisfactory, due to omissions or inadequacies
F	Largely unsatisfactory, significant tasks poorly conducted or not attempted at all
N/A	Not applicable

(Source: Lee & Colley, 1992)

**Review Area 1: Description of development, the local environment and the baseline conditions**

Review Area 1 summarised three review categories (see Table 3). The aim of these review categories was to describe the proposed development, the site that the project will be situated and lastly define the receiving environment and the baseline conditions. This was in order to provide an understanding of the nature of the project as well as the potential impacts the project may have on the receiving environment.

**Table 3: Summary of categories of Review Area 1.**

Category numbering and description	Well performed	Satisfactory and complete	Just satisfactory	Certain sections well attempted, unsatisfactory	Task poorly attempted	Task not attempted
	A	B	C	D	E	F
a) Description of the development	•					
b) Description of the environment			•			
c) Site description and baseline conditions			•			

(Source: field data, 2024)

The study evaluated the EIA that was undertaken at the Chilanga Cement plant using the Lee and Colley Review Package. The evaluation revealed that Area 1 was well performed ‘A’ in terms of the description of the environment and the baseline conditions. This means that there were no major omissions or inadequacies in their compilation. The section that recorded description of the environment scored ‘C’ or satisfactory ratings. This can be attributed to inadequate information and incomplete information in some sub-categories. For example, the map provided was blurry, meaning that their focus or resolution was not appropriate. No attempt to determine the probable future state of the environment if the development is not carried out was made in the report. This explains why the overall assessment of the report was satisfactorily attempted.

## Review Area 2: Identification and Evaluation of Key Impacts

The identification and evaluation of key impacts is generally considered the core activity of the EIA process. The aim of Review Area 2 is to define the impacts of the project, identify the effects of the project, and identify the effects that they will have on the biophysical and socio-economic environment, as well as quantify the impacts in terms of their magnitude and significance (Glasson et al., 2012). The results of this Review Area is shown in Figure 4.

**Table 4: Summary of categories of Review Area 2.**

Category, numbering and description	Well performed	Satisfactory and complete	Just satisfactory	Certain sections well attempted, unsatisfactory	Task poorly attempted	Task not attempted
	A	B	C	D	E	F
a) Impact assessment process						
b) Definition of impacts						•
c) Magnitude and Severity of impacts						•
d) Identification of impacts			•			
e) Direct impacts			•			
f) Indirect impacts				•		
g) Positive impacts				•		
h) Negative impacts		•				
i) Cumulative impacts						•

(Source: field data, 2024)

The findings of the study showed that the identification and evaluation of key impacts was the most poorly attempted Review Area. The overall quality score for Review Area 2 was satisfactory or rating ‘C’. The researcher then sought to find out the reasons as to why impact

identification was poorly done. One of the experts from ZEMA, Mr. ZM, said that “the poor impact evaluation and identification could be attributed to the fact the impacts were only listed in the EIA report and no definition was given”. For example, the report provided insufficient information on the possible effects on the environment, choosing to cover the impacts as a whole, even though the international EIA regulations require that impacts are identified separately.

Further, the report failed to quantify the impacts as short-, medium- or long-term but instead grouped them as a whole in one category. Another deficiency that was observed was the lack of sufficient information provided on the expected interaction of the impacts with humans, fauna, and flora. This means there was poor consideration of cumulative impacts that can create more harmful effects and, yet, consideration of cumulative impacts is as important as that of direct and indirect impacts. As Shrimpton and Storey (2000) argue, assessment of impacts of individual projects is important but assessment of single actions may miss the bigger picture of impacts.

The manner in which the impacts were identified was not well described nor the methods used. The impacts were also not identified with respect to stages of the development as specified in the EIA guidelines. Identification of the impacts in pre- and post-construction stages of the projects was missing from the report. The focus was just on the construction and operation stage of the projects. This resulted in consultants leaving out significant impacts of the projects. Further, Mr. ZM argued that “*EIA should be a means to good environmental management over the life of a project not at certain stages of the project*”. This implies that the consulting teams were mostly concerned with the consequences of putting up the projects rather than with the consequences of the project once put up. This code of practice undermines the very concept of environmental sustainability for which EIA is earmarked because, as postulated by Mhango (2005), there is no justification whatsoever to assume that a project would have no impacts in the post-construction phase since there is a reaction to every action.

Similarly, supporting data and scientific or analytical methods were hardly used in identification of impacts. The identification of impacts relied heavily on experts’ judgement, checklists and literature review of similar nature. As Mr. ZM<sub>2</sub> argued that

*“reliance on literature reviews of similar projects undermines the effectiveness of impacts analysis because even similar projects are bound to have differences when implemented in different environments under different circumstances”.*

### **Review Area 3: Alternatives and Mitigation of Impacts**

As for the Chilanga Cement plant EIA, the examination of the alternatives for the projects poorly done. Table 5 provides a summary of results on how the mitigation measures made provision for mitigating planning and procedures for dealing with environmental incidents during various phases of the project lifecycle. This means that the tasks were properly considered.

**Table 5 Summary of categories for Review Area 3.**

Category numbering and description	Well performed	Satisfactory and complete	Just satisfactory	Certain sections well attempted, unsatisfactory	Tasks poorly attempted	Tasks not attempted
	A	B	C	D	E	F
a) Alternatives				•		
b) Mitigation Measures			•			
c) Mitigation plans for various phases of the project				•		

(Source: field data, 2024)

The findings from the EIA report failed to satisfy the requirements for consideration of alternatives. These findings further indicate that the adequacy of the report in as far as providing the decision-makers with necessary information, to make informed decision with regard to the licensing of the project is highly questionable and so is the ability of EIA to be used a tool to safeguard the environment in Zambia.

The main weakness of Review category 2 resulted from the limited number of alternatives proposed and assessed and the complete omission of assessment of a no-action alternative in all the EIA reports reviewed.

The main reason for the limited number of alternatives proposed is that EIA exercises

are undertaken rather late in the project planning and design feasibility stages. As a consequence, the findings are not always able to bring about consideration of alternative site layouts, location, technology or effective mitigation measures. This is a common weakness in developing countries (Wood, 2003). EIA reports are too often submitted after the project has been defined and the site acquired.

This research established that the no action alternative was ignored in the report despite the emphasis in the EIA regulations that it must be examined. Thus, there was no comparison whatsoever of the pros and cons of not going ahead with the project to that of undertaking the project. This suggests that the analyses are often undertaken to justify a decision that has already been taken to commission a project, rather than to propose and adopt the most feasible course of action.

The overall quality score for Review Area 3 is satisfactory 'C' and, hence, a greater room for improvements. The report showed that much attention was given to air pollution, noise pollution and dust emissions, leaving out other impacts, such as soil and water pollution.

#### **Review Area 4: Communication of Results**

Public participation being part and parcel of EIA has been made a mandatory requirement in Zambia. However, the nature and extent of public participation is still poorly handled. The report failed to satisfy any of the requirements of public participation. This means public views were not sought and taken into consideration. This shows that, although public participation is enshrined in legislation and in the guidelines of EIA, it is often neglected. It is often only conducted to meet legislation requirements rather than to consider communities' views in predicting and mitigating impacts. When community participation and consultation is not incorporated in project development, disputes are bound to arise and thereby causing delay with project implementation (Wood, 2005). As for the Chilanga Cement plant, the EIA did not communicate the results to the public and other stakeholders for decision-making. Thus, the overall quality score for Area 4 was unsatisfactory 'C'.

From the findings, it is clear that all the four review areas were poorly attempted in a satisfactory manner. A review of the EIA report revealed that the identification and

analysis of impacts during the assessment were not done satisfactorily. Quite often, impacts were not adequately qualified in terms of significance and there was no formal consideration of project alternatives. Without the prediction and justifying the significance of an impact one cannot, with certainty, establish which consequences of a project are critical and warrant a high degree of priority (Wood, 2005).

Public concerns were hardly incorporated in the final report by the developer. The Review Areas 1 and 4 were also not well performed. The overall quality of the EIA report was rated as very unsatisfactory by the researcher. This shows that the adequacy of the report in terms of providing all the necessary information critical to authorities making informed decisions is very questionable. In general, the quality of EIA reports produced by consultants is a major concern in Zambia. Mr. ZM<sub>3</sub> argued that *“concerns mainly arise from the increased number of individuals carrying out EIAs which have brought with it inexperienced practitioners whose quality of work leaves a lot to be desired”*.

From the interviews, 80% of the respondents pointed out that the EIA report review practice in Zambia is considered unsatisfactory. The EIA proclamation specifies that the responsible bodies for reviewing process is the Environmental Protection Agency and the process need to be carried out by taking into account any public comments and expert opinions. The Procedural Guideline also states that reviewing is expected to be conducted at various stages in the EIA processes, which include screening report, scoping report, terms of reference, environmental impact assessment report, and performance (monitoring or audit) reports at different stages in the project cycle.

According to Sosovele (2011) *“the reviewing activity in the country is desk review neglecting the views and concern of public and other interested groups”*. However, the study found out that this has not been properly implemented. The other challenges facing the reviewing process include absence of range of multidisciplinary technical expertise needed to assess the adequacy and comprehensiveness of an EIA report and institutionalized review practices. This has resulted in inadequate reviewing of draft EIS that renders its ineffectiveness as a tool for sound decision-making.

The Environmental Impact Statement (EIS) is assumed to be of paramount importance

in determining the decision of whether or not the project should be implemented. However, 93% of the respondents indicated that the EIA decision-making process in Zambia is evaluated as unsatisfactory. It is the responsibility of ZEMA, in collaboration with relevant stakeholders, to give decisions on the development proposals with respect to environmental matters. In the actual sense, EIA reports are prepared but have little or no effect on the decision-making process (Shepherd, 2012). In some cases, EIA begins after the construction commences and is used only to confirm that the environmental consequences of the project are acceptable. The above assessment clearly shows that EIA practice in Zambia falls considerably short of the internationally accepted standards.

#### **4.3. Effectiveness of the Mitigation Measures Proposed In the EIA Report for the Chilanga Cement Plant**

There were a number of mitigation measures proposed in the Chilanga EIA report. Among these was the use of best available technology. In line with this recommendation, the project proponent installed relatively new technology at the plant. From the results of the study, it is evident that the new technology installed in the new plant has been effective in mitigating environmental problems, such as dust emissions, land pollution, and solid waste. To demonstrate this, a comparison was made between the old and new plant using the data from ZEMA.

##### **4.3.1. Methods of Cement Manufacturing Process**

Cement at Chilanga Cement plant is manufactured by the following two processes: the wet process and the dry process.

###### **i. Manufacturing of Cement by Wet Process – Old Plant (Chilanga 1)**

This study sought to find out the technology that was used at the old and the new Chilanga plant. This is because technology not only improves the quality of cement but also reduces environmental impacts from the production process. The response from respondent CP1 was as follows.

“The old plant which did not undergo an EIA uses the wet process which is an old cement manufacturing process”. This process has the characteristics of simple operation, low dust and easy transport. The wet process involves handling materials in a slurry form, reducing the generation of dust compared to the dry process. However, the

heat consumption of the wet process is very high, generally between 5234-6490 J / kg and the consumption of the areas of the ball mill is high. Therefore, the wet process typically requires more energy due to the need for slurry preparation, handling, and drying of the materials. Making the process longer for Cement production compared to the dry process, as it involves additional steps such as slurry formation and drying.

This finding is consistent with Ohunakin et al. (2013) who stated that ‘’ the wet cement processing method consumes approximately 5995.59 MJ/ton of the overall intensity and employ about 35% of combustion energy per tonnage of cement more than the dry method whereas the dry cement process consumes 3609.75 MJ/ ton. The high energy consumption of the wet process over the dry can be attributed to the mix preparation method adopted prior to burning of clinker in the kiln (water being added to the raw materials to form raw thick slurry), whereas the dry process is only based on the preparation of fine powdered raw meal by grinding raw material followed by drying.

#### **ii. Manufacturing of Cement by Dry Process – Old Plant (Chilanga 2)**

With regards to the new plant, the second respondent, CP2, gave the following response: “The new plant (Tukule), which was subjected to an EIA, opted for the best available technology. The dry process, due to its energy efficiency.” This process requires less energy compared to the wet process, thereby reducing fuel consumption and associated greenhouse gas emissions. The dry process is generally faster in terms of cement production, as the raw materials can be ground and processed more quickly compared to the wet process. The process also allows for better control over the chemical composition of the raw materials, resulting in more consistent and higher quality Cement.

From the above planation, it can be concluded that the EIA process conducted on the new plant has played a role in reducing some environmental impacts by adopting the best available technology for cement production than continuing with the old method which has more environmental impacts.

#### **4.3.2. Performance of the Plants (Old and New)**

The performance of the two plants was assessed with regards to the emission of pollutants. The problem of fugitive emissions occurs during every stage of the cement

manufacturing process, and poses a huge challenge.

**i. Air Quality (Dust) Assessment of the New Chilanga Cement Plant**

The results of the study show that there were differences in the performance of the old and new plants with regard to dust emission levels. The question asked was the extent to which the EIA had the desired impacts with regard to air and dust emissions from the two plants (what accounts for the differences in terms of meeting the statutory requirements). The response from CP<sub>2</sub> was that “the primary advantage of the dry process is that it is more energy efficient than the wet process.” This is because the dry consumes less power and produces less waste than the wet process, making it a more environmentally friendly option. Additionally, the dry process is better suited for applications that require high-strength, durable cement, such as infrastructure and building construction. CP<sub>3</sub> further indicated that one of the primary drawbacks of the dry process is that it produces more dust than the wet process. The dry process releases dust into the air, which poses health risks to workers and nearby communities.

Further, the Prevention and Pollution Abatement Handbook (1998, p.13) brings out scientific evidence which indicates that combustion of fossil fuels from cement production causes a spectrum of health effects from allergies to death.

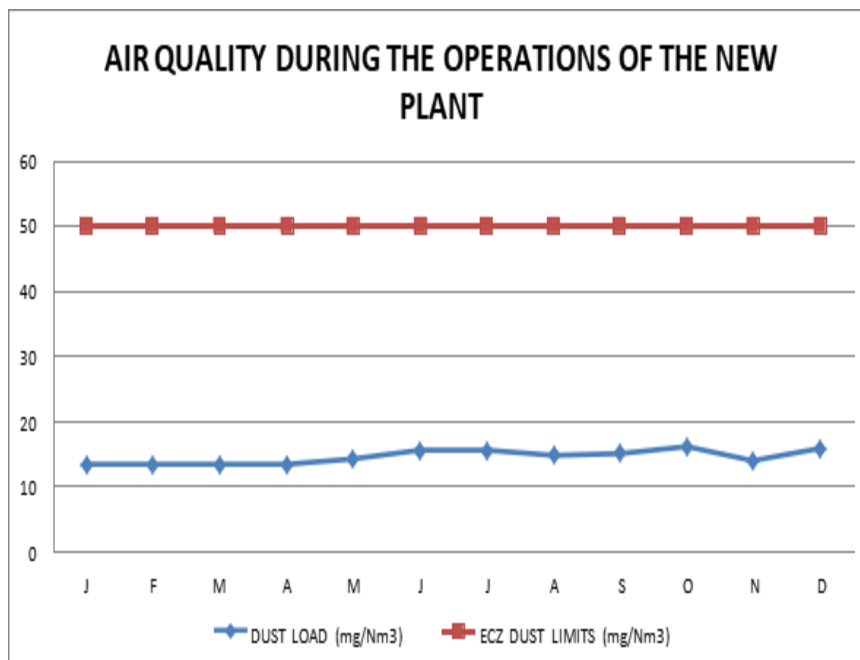
On the performance of the plants (old and new), 66.6% of Musamba and Freedom residents said that the dust from the Chilanga Cement plant had affected their crops. Mrs. A from Musamba township complained that her crops were not growing well because of the dust. She said there was too much accumulation of the dust on the plants which was very difficult to remove. According to her, this had reduced the productivity of the tomatoes she was growing. The researcher further, observed that the leaves of Mrs. A’s plants were covered in dust. This agrees with the study by Manjula et al. (2014), who acknowledged that cement dust affects plant productivity due to reduced chlorophyll content of the leaves, which obstructs the photosynthesis process.

Further, results of several studies show that emissions from cement production adversely affect human health in a variety of ways, like, respiratory diseases like tuberculosis, chest discomfort, chronic bronchitis, asthma attacks, cardio-vascular

diseases and even premature death (Nkhoma et al, 2017).

From the interviews conducted in Freedom compound, participants complained that children and adults suffered from respiratory tract infections (RTIs), such as sneezing and coughing, as a result of dust emissions. A study done by Manjula et al. (2014) established that particulate emissions contain harmful toxic metals and compounds such as lead, chromium, nickel, and barium which can pose a serious health hazard to human health. Mrs. B further told the researcher that Chilanga emitted a lot of dust, especially at night although during the day, all seems to be well. The respondents noted that the reason for emitting dust at night was to conceal the fact that the company emitted a lot of dust. Hence, the plant pretends to emit less emissions than it actually does.

In this instance, it is, therefore, apparent that the Chilanga Cement plant is also causing adverse effects on both the natural and the human environment. Cement production is often associated with the release of significant quantities of gaseous emissions. The emissions are classified into particulate matter (PM), which is a complex mixture of extremely small particles and liquid droplets, along with other gases such as Nitrogen Oxide (NO<sub>x</sub>), Sulphur Oxide (SO<sub>2</sub>), and Carbon Dioxide (CO<sub>2</sub>) (Chilanga Cement Plc, 2000). Figure 3 shows an assessment of the dust emission rates for the plants for the year 2022.

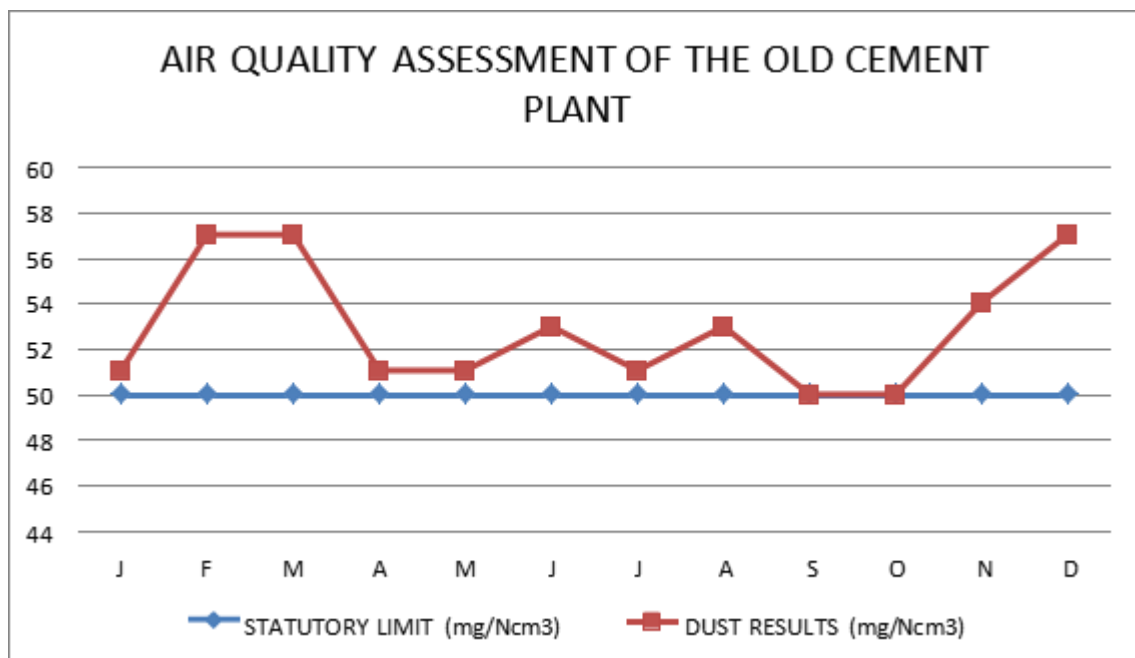


**Figure 3: Dust emissions from the new plant against ZEMA standards, 2022.**

(Source: Field data, 2023)

From Figure 3, it can be seen that the new plant, which was subjected to an EIA, is within the prescribed standards for dust emissions. In this regard, it may be argued that perhaps technology accounts for the difference. At the same level, it could be argued that this is due to some mitigation measures being implemented, such as the pulse jet bags which trap the dust. For control of fugitive dust emissions, ventilation systems equipped with fabric filters are used in conjunction with hoods and enclosures covering material conveyors and transfer points. Good in-plant housekeeping and regular wetting of the quarry haulage road also reduces fugitive emissions.

Stack emissions compliance was carried at Chilanga Cement plant at the clinker cooler, the kiln and coal mill stacks. Measurements for particulate emission rates were carried out at all stacks with sampling ports located at recommended heights. The STL combi dust sampler was used for isokinetic dust sampling to determine dust loading in the stacks off gases. The gaseous pollutants in the off gases were measured using the Testo 350 Gas analyser to determine the concentration of Sulphur dioxide, carbon monoxide, nitrous oxide and other pollutants. The dust concentration at the centre points at the cement mill are all below the allowable emission limit.



#### **Figure 4: Dust emissions from the old plant against ZEMA Standards.**

(Source: Field data, 2023)

As can be seen from fig 4, the results obtained from the kiln stack of the old plant are above the allowable emission limits, 50 mg/Nm<sup>3</sup>. This can be attributed to the old technology which is being used at the old plant. It was then concluded that the operations at the plant have been contributing to pollution which has affected air quality and land resources in Chilanga. This contamination has been resulting from the grinding and handling of the raw materials which emit dust.

#### **4.4. Implementation of Mitigation Measures on Air Pollution Identified in the EIA**

According to the World Bank (2012) ‘‘Particulate matter, commonly called dust, is the primary emission in the manufacture of cement’’. The following varieties of dust are generated in the operation of Chilanga Cement plant: raw material dust, dust from limestone, exit dust from kilns, and cement dust. These dust emissions are a detriment to the environment. The researcher asked the following question: *What measures have been put in place to ensure that the mitigation measures on air pollution are adhered to by the plant?*

Mr. D from the plant mentioned that the company has been very committed and consistent when it comes to the aspect of suppressing dust as the company has been using water bowsers on a daily basis to sprinkle the road from the quarry to the cement plant. During the weeks of data collection, the researcher observed water bowsers sprinkling water on the road going to the quarry, an indication that the company is making efforts to minimising air pollution. Mr. D further told the researcher that the company has been suppressing dust by spraying water on materials during crushing and in transit in order to trap dust.

When asked about the implementation of the mitigation measures employed at the plant, respondent CP3 explained that *‘‘for the control of dust, the plant has installed mechanical collectors, filters and electrostatic precipitators. Unfortunately for the old*

*plant the electrostatic precipitators are poorly operated and maintained hence they do not adequately collect dust from the kiln.”*

In the case of the new plant, the EIA mitigation measures in the report included among others the following: a reduction in energy consumption, ambient air quality, noise pollution, and waste management. Table 6 shows how the plant had mitigated the varying impacts as a result of the production process.

*Table 6: Implementation schedule for the mitigation measures.*

<b>ENVIRONMENTAL MEDIUM</b>	<b>IDENTIFIED IMPACT</b>	<b>MEASURES</b>	<b>ADHERENCE</b>
1. Energy consumption	Air pollution (Pollutants of concern include Nitrogen Oxide, (NO <sub>x</sub> ), Sulphur Oxide (SO <sub>x</sub> ), Carbon Monoxide (CO)	Introduction of the modern dry process	The introduction of the dry process has led to a reduction in the production of gases such as Nitrogen Oxide (NO <sub>x</sub> ), Sulphur Oxide (SO <sub>x</sub> ) and Carbon Monoxide (CO) levels. This is monitored throughout operation Hours

2. Air	Air pollution	Control of emissions using the pulse jet bag filters, fabric bag house filters	<ul style="list-style-type: none"> <li>- Existence of pulse jet bag filters</li> <li>- One set of the dust measuring equipment is installed in the main stack (kiln and raw mill exhaust), another set is installed in the cooler exhaust stack.</li> <li>- Fabric bag house filters are mounted in ventilation systems. These de-dusting systems are installed at all materials transfer points, crusher systems, clinker and cement storage silos, cement</li> </ul>
			Packing equipment and the coal storage facility.
		Covering of raw materials stockpile	Not all raw materials stockpile areas are covered and enclosed.
3. Noise	Noise pollution	Workers wear ear plugs.  Covering of the coal mill building	No ear plugs being worn  The coal mill building is not covered
4. Solid waste	Land pollution	Generated waste to be stored in well secured containers	Generated waste is stored in containers All materials with alternative use value such as, scrap metal, paper, and plastics are screened for reuse by Chilanga

(Source: Field data, 2024)

The findings in Table 6 provide evidence that Chilanga Cement plant is only partially implementing the mitigation measures identified in the EIA. The company has mainly focused on mitigation measures that relate to the control of air emissions from the plant. A detailed comparison of the old plant with the new plant showed that the new plant was within the statutory limits for dust emissions (see Figure 1 and Table 2). The study established that the statutory limits provided an impetus for Chilanga to continue with mitigation measures.

#### **4.5 Challenges to Implementation of Mitigation Measures**

The results of the study show that there are a range of challenges that prevent the effective implement of EIA mitigation measures. Table 7 summarises some of the challenges.

*Table 7: Views of practitioners on the challenges faced in implementation of mitigation measures.*

<b>ACTORS INVOLVED IN THE EIA</b>	<b>CHALLENGE IDENTIFIED</b>	<b>RATING</b>
1. Factory Inspectors	<ul style="list-style-type: none"> <li>- Some mitigation measures are not achievable;</li> <li>- Implementation of mitigation measures is expensive.</li> </ul>	<ul style="list-style-type: none"> <li>- 8 out of 10 showed that some measures are not achievable;</li> <li>- 9 out of 10 indicated that implementation of mitigation measures is expensive.</li> </ul>
2. EIA Consultants	<ul style="list-style-type: none"> <li>- Lack of personnel (local expertise)</li> </ul>	<ul style="list-style-type: none"> <li>- 7 out of 10 indicated the lack of local expertise.</li> </ul>
3. EIA Regulators	<ul style="list-style-type: none"> <li>- Inadequate Technical personnel</li> <li>- Mitigation measures do not address the negative impacts on the environment</li> <li>- Inadequate funds for compliance monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- 7 out of 10 indicated the lack of trained personnel in environmental science;</li> <li>- 6 out of 10 revealed that some measures do not address the impacts on the environment;</li> <li>- 7 out of 10 noted that lack of funding hinders Implementation of mitigation measures</li> </ul>

(Source: Field data, 2024)

The study discovered that the most outstanding challenge faced in implementing EIA mitigation measures was the fact that implementation is very expensive. A total of 9 out of 10 (90%) workers indicated that the EIA process is quite expensive and this has created a situation where some recommended mitigation measures have not been implemented. Only 1 out 10 (10%) of the workers disagreed with the above challenge adding that the plant makes large sums of profit from the sales of cement and therefore they can be able implement all the recommended measures to ensure that the environment is protected.

In addition, Mr. Z, an EIA expert from ZEMA, revealed that the lack of resources (funding) has created a situation where projects with possibly huge impacts on the environment are not sufficiently audited or monitored to ensure that they were complying with regulations, or implementing mitigation techniques. In the end monitoring is left to the project proponent to ensure their findings are accurate, with little or no oversight from ZEMA. The experts further highlighted the lack of follow-up and undue political influence as the major challenges to the implementation of EIA mitigation measures.

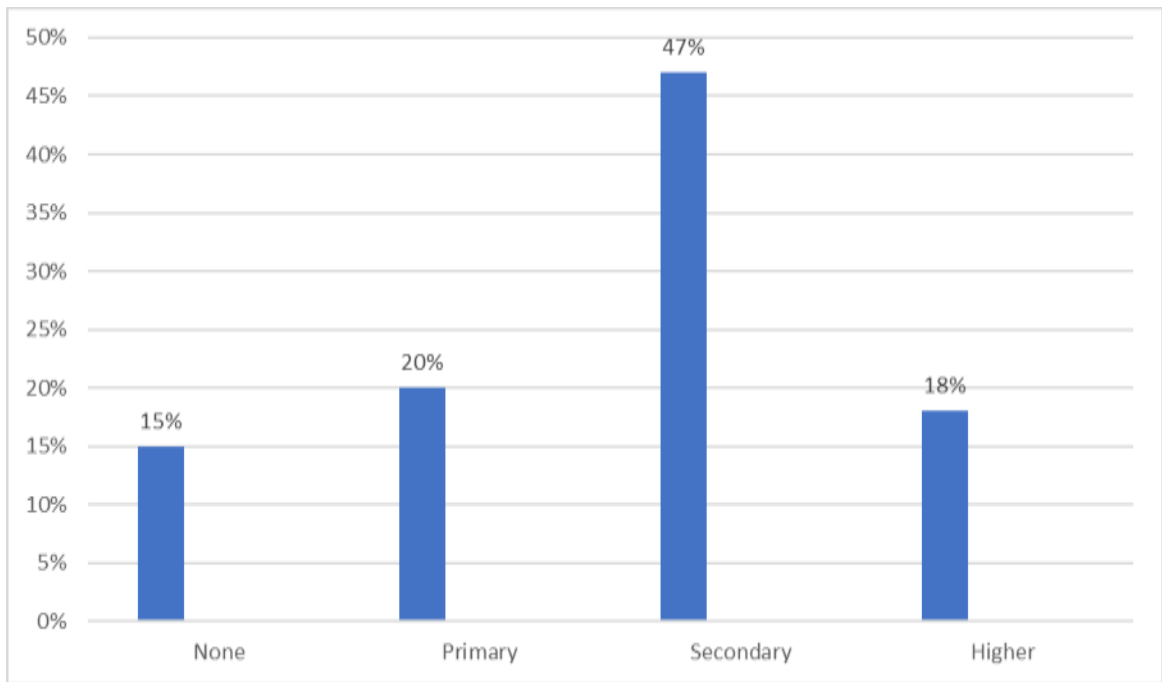
Further, 8 out of 10 (80%) of the respondents from ZEMA and Chilanga Cement plant

agreed that some mitigation measures are not achievable i.e. cannot be implemented. This is attributed to some logistical problems, especially where services and facilities for effective environmental management and monitoring are limited. For instance, waste disposal sites are inadequate with no hazardous waste disposal sites. When it comes to analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers over time (cumulative impacts), 9 out of 10 (90%) respondents from ZEMA indicated that in most of the projects, this area is neither addressed nor handled inadequately.

#### **4.6. Community Participation in the EIA Process of the Chilanga Cement Plant**

The EIA system in Zambia makes provisions for public participation in the process. The purposes of public participation are to promote transparency, encourage openness in the process and build ownership of development decisions as well as programs and projects. It encourages citizens to be more engaged in the decision-making processes that have an impact on their local community. There is a direct correlation between public participation and educational background of the public. People with a higher level of education can to a large extent possess good literacy and communication skills and therefore tend to participate more readily and actively in the EIA process since they can provide useful suggestions and opinions (Zhao, 2012).

One question sought to find out the education status of the respondents and the findings were that the majority of the respondents passed through some formal education and the minority 15% did not. This was a very important aspect of the research as having many people go through education makes it easy for them to understand the environmental impacts emanating from projects.



**Figure 5 Percentage distribution of respondents by highest level of education completed.**

(Source: Field data, 2024)

The findings of the study as presented in Figure 8 show that some respondents had some educational background. This enabled them to identify some of the problems they faced as a result of the Chilanga Cement project.

As per basic principle of the EIA process, the project proponent has the responsibility to inform local people about proposed project and is obliged to provide a forum, which enables people to participate in the EIA process. This is expected to done through public displays and public meetings. Table 8 shows the extent to which the public was involved in the Lafarge Cement Plant EIA process.

**Table 8 Extent to which the public participated in the Chilanga Cement Plant EIA process.**

EIA STAGE	REQUIREMENT FOR PUBLIC INVOLVEMENT	EXTENT OF PUBLIC PARTICIPATION
	58	

1. Screening (Sour)	Informing the public on proposed project and seeking their views	<ul style="list-style-type: none"> <li>- developer did not seek for public opinion about the development;</li> <li>- communities near the project site didn't not know anything about the development not until operations begun;</li> </ul>
2. Impact Identification:	Public to participate in scoping exercises, open public meetings & hearings on project	<ul style="list-style-type: none"> <li>- developers did not consult the public;</li> </ul>
3. Public participation during EIA review period	Public participation through the process of making relevant EIA documents available members of the public in specified places	<ul style="list-style-type: none"> <li>- none of the affected and interested parties were involved in the review process;</li> <li>- documents were not made available for public scrutiny;</li> </ul>
4. Public participation during and after decision-making	Communicating the outcome of EIA decisions to the public	<ul style="list-style-type: none"> <li>- the public was not informed on the nature of decisions taken on the EIA;</li> <li>- there was limited disclosure of decisions to the public.</li> </ul>

2024

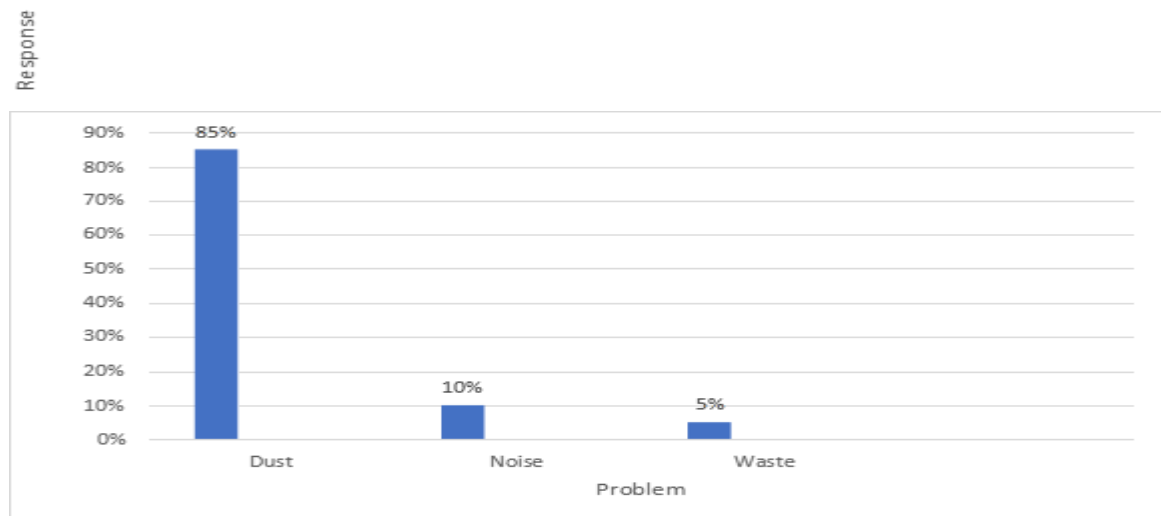
The findings of the study revealed that, in all the four (4) processes that require community participation, the public was not involved, as can be seen in Table 6. The requirement was for the developers to provide and display EIA documents to enable the local people and other interested parties visit the displays and learn about the project. In this regard, the project proponents for the Chilanga Cement plant did not adequately meet this requirement.

The inclusion of public views and comments in the decision-making process promotes equitable and informed choice, leading towards better and more acceptable social and environmental outcomes (World Bank, 2009). At a minimum, the EIA process should provide for public notification, disclosure of information on a proposal, access to EIA documentation and comments by affected and interested parties on scoping and EIA reports. In addition, the procedures for public consultation should allow for all interested and affected parties to express their views (Nadeem & Fischer, 2010). Lack of inclusion of the local people has led to a situation where the concerns of the local people are not considered and made useful.

Almost similar practices are followed in some African countries. For example, among over thirty EIA processes reviewed in Tanzania by Mwalyosi & Huges (1998), only two incorporated a structured approach to public involvement as part of the EIA study and, the level of involvement was “consultative” rather than “participatory” (Mwalyosi & Huges, 1998, cited in ECA, 2005). This finding is very similar to the findings of the study with regard to public participation in the EIA process.

#### 4.7 Environmental Concerns

The major problem highlighted by 85% of the respondents from Freedom and Musamba townships was dust emissions as a result of the cement operations. Respondent F<sub>1</sub> also mentioned poor sanitation, while one respondent from Musamba (M<sub>1</sub>) added that they have been experiencing prolonged coughs which could be as result of exposure to the dust emissions from the plant. An interview with the ward councilor for Chilanga ward confirmed that the residents have been complaining of dust emissions which have not only affected their health but also crop productivity.



*Figure 6: Major problems affecting the residents in Musamba and Freedom townships.*

(Source: Field data, 2024)

Despite the cement company having implemented the environmental management plan (EMP) regarding reduction of the effects of cement production, the residents have continued to face air pollution in terms of dust emissions coming from the plant. One of

the respondents from Freedom compound, by the name of M<sub>2</sub> reported that he had made a report to the Lusaka City Council citing dust nuisance as a major problem facing the community around the plant. However, according to him, he was only asked to leave a note and his phone number and no response came forth from the Council.

#### **4.8 Chapter Summary**

The aim of this study was to evaluate the effectiveness of the EIA practice in Zambia in contributing towards sustainable development. The evaluation revealed the strengths and weaknesses of the system which can be used to suggest ways of improving the performance of the system. The evaluation was done against a criterion developed from a review of relevant literature. The study produced some unexpected results, contradicting findings from other studies. This can be viewed as a sign of improvement in the current EIA practice. However, some of the research findings confirm the findings of previous studies. According to the analysis of the results of this study, the EIA system in the cement industry seems to meet a significant proportion of the evaluation criteria developed for this study to a satisfactory level. However, as mentioned earlier, some shortcomings have been identified. The system can be said to be just satisfactory as far as contribution towards sustainable development is concerned despite the weaknesses within the system. Sadler (1996) acknowledges that EIA does contribute to meeting the goal of sustainable development but does not reach its full potential due to certain shortcomings. Zambia has a comparatively strong legal basis for environmental management. Given this strong legal basis for environmental protection, the benefits of environmental protection and sustainable development can be enhanced if the areas of weakness are addressed.

## CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

### 5.1. Overview

This chapter includes the main conclusions of this work, concerning the effectiveness of the Environmental Impact Assessment process in contributing sustainability in Zambia. The conclusions presented here are based on the analysis of data gathered in the light of a review of relevant literature. The conclusions of this research are also used to derive recommendations to improve the functioning of the EIA process in the Zambian context.

### 5.2. CONCLUSIONS

The purpose of this study was to evaluate the effectiveness of the EIA practice in Zambia using the Chilanga Cement plant. The objectives of the study were to:

- i. evaluate the quality of the EIA process conducted at Chilanga Cement plant against international EIA standards;
- ii. assess the extent to which environmental mitigation measures identified in the EIA report for Chilanga Cement plant have contributed to the reduction of environmental problems emanating from the plant;
- iii. examine the challenges faced in the implementation of mitigation measures;
- iv. Examine the extent to which the affected communities participated in the EIA process of the Chilanga cement plant.

**Objective (i):** while EIA in Zambia is based on a set of principles, its implementation often falls considerably short of international standards. They frequently suffer from insufficient consideration of impacts, alternatives and public participation and hence raise the concerns of whether EIA does influence decision-making or not. Given that EIA is often the chief and most comprehensive means of assessing potential environmental and social impacts of major development projects these inadequacies are particularly troubling, especially in countries where environmental safeguards are weak due to deficiencies in regulation, enforcement or both.

**Objective (ii):** Despite the availability of various mitigation options, their adoption rates in the cement industry have been inadequate. One of the strategies for carbon

emission mitigation in the cement industry is improving the efficiency of energy usage. This involves optimizing fuel and electricity use in cement plants, which can significantly reduce CO<sub>2</sub> emissions. This strategy holds great potential for reducing carbon emissions in cement production at the Chilanga cement plant. This has contributed to the plant's sustainability and helping meet global carbon emission reduction targets. The old cement plant can also improve energy efficiency through equipment replacement and process optimization.

**Objective (iii):** In the case of the Chilanga cement plant, there has been insufficient level of analysis of the information gathered by the proponent. Most of the EIAs' information is limited to purely descriptive input without any serious effort to analyze its significance or determine its relevance for the specific project. This is attributed to a lack of expertise and insufficient baseline data.

**Objective (iv):** The participation of the local people acts as a safeguard ensuring that the EIA has not overlooked the envisaged impacts on the community concerned. This participatory involvement should begin from the point of the project identification and continue throughout the project cycle. However, in this study, this was not adhered to. This calls for remedial measures such as spelling out that the participation of the local people is of equal importance and inseparable from the process itself. This is because EIAs are expected to contribute to the final project design, give the public a say in the project, and add to overall environmental awareness among involved parties.

For EIA to fulfil its real potential, Zambia needs capacity-building for administrators, practitioners and the public; monitoring of compliance with EIA recommendations; sharing of best practice across the region; linking EIA with the full project life cycle; harmonisation of legislation within the region; and strengthening the links between EIA, regional planning and other high-level decision-making processes. There is also a need to dispel the impression that EIA is an obstructive process that keeps people in poverty rather than one that ensures future generations will enjoy resource security and a good quality of life.

### **5.3 Recommendations**

This chapter aims to provide recommendations made from the research for EIA practice in Zambia.

This study recommends that the project proponent, through the EIA team, should engage members of the community that are directly affected by projects at a personal level.

This study recommends that the current EIA practice should be upgraded to improve the consideration of cumulative impacts. This requires the application of innovative tools and measures

This study recommends that a mechanism should be put in place to ensure monitoring of project impacts for the protection of the environment. This could possibly be achieved by establishing stronger links between projects and ongoing environmental management. This will assist in the identification and rectification of impacts that were not detected during the EIA process

Develop best practice guidelines for public participation to assist consultants with strategies for effective public participation at all levels.

Develop capacity building programmes based on clearly identified needs, considering experience and lessons learnt. The capacity building programmes should be aimed for the authority, the proponents and the EIA practitioners and the general public.

### **5.4 Future Research**

This study suggests that future research directions should enhance the effectiveness of using System Dynamics (SD) models to evaluate mitigation strategies for different projects. Systems dynamics (SD) is a simulation method used to understand the nonlinear behavior of complex systems over time. It is commonly used in various sectors to predict emissions and conduct policy experiments. Due to the poor implementation of carbon mitigation strategies within the cement industry, enhancing policymaking by employing more advanced decision-support tools is necessary. Further, these models should assess the effectiveness of mitigation techniques and aid decision making. The scope of such models determines their usefulness to stakeholders.

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## APPENDICES

### Appendix 1 - Questionnaire for Chilanga Cement Plant

Dear respondent,

My name is Patricia Mwelwa, a master's student at the University of Zambia. I am carrying out a study on the "Effectiveness of Environmental Impact Assessment (EIA) process in Zambia using the Chilanga Cement plant as a case study". 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. 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.

#### SECTION A: Background Information

Sex	Female Male
Age	20 – 30
	31 – 40
	Above 41
Organisation/Position held	
Experience in EIA related work	

#### SECTION B: Legislative provisions for implementing Environmental Impact Assessment in Zambia

Definitions of rating categories

Adequate – generally satisfactory and complete for intended purpose

Inadequate – not satisfactory because of significant omissions though parts are attempted

None – existent- not stipulate as a legal provision

Legislative provisions	Level of adoption		
	adequate	inadequate	None- existent
Legal provisions for appeal by the proponent or stakeholders against decisions			
Public participation			
Post decision monitoring			
Grievance procedure			
Implementation of mitigation measures			

**SECTION B: Implementation of Mitigation Measures**

<b>Statement</b>	<b>Response</b>
All EIA mitigation measures have been implemented at our industry	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
Some mitigation measures have been implemented	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
Implementation of EIA mitigation measures has many challenges	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
The management at our industry normally carries out environmental audits/inspections	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
ZEMA regularly carries out environmental audits/inspections at our industry	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
Community members are always consulted and involved in implementing EIA mitigation measures	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure

**SECTION C: Challenges faced in implementing mitigation measures**

Implementing all the mitigation measures is very expensive	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
Some mitigation measures have not been implemented because it is costly	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
There is lack of a person with necessary expertise to deal with environmental issues at our factory/industry.	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
The recommended mitigation measures do not address the anticipated negative impacts on the environment	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure
Some mitigation measures are not achievable i.e. cannot be implemented	<input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Not sure

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

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

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

.....  
END

**Thank you for your time.**

## Appendix 2 - Questionnaire For ZEMA

### Dear Respondent;

My name is Patricia Mwelwa, a master's student at the University of Zambia carrying out a study on the “*Effectiveness of Environmental Impact Assessment (EIA) in Zambia using a case of the Chilanga Cement Plant*”. 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. 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.

### SECTION A: Background Information

Sex	Female
	Male
Age	20 – 30
	31 – 40
	Above 41
Organisation/Position held	
Experience in EIA related work	

SECTION B: Legislative provisions for implementing Environmental Impact Assessment in Zambia

1. Is there legal provision for EIA in Zambia?

.....

2. How long has the regulations governing EIA in Zambia been in force?

.....

3. Are there any guidelines that practitioners have to follow when undertaking EIA studies?

.....

4. What are the strengths of the current EIA practice in Zambia? *Please tick a maximum of 3*

Good basis in legislation    ensures consideration of impacts Involves a variety of stakeholders implementation of mitigation measures Lots of guidelines    post decision monitoring

Other.....

5. What are the weaknesses of the current EIA practice in Zambia? *Please tick a maximum of 3*

Inadequate consideration of alternatives

consideration of cumulative impacts

Lack of public involvement

limited control over quality of EIS

Insufficient post decision monitoring            poor scoping regulations

Limited influence in decision making

Other *Please State*.....

6. If you were given the opportunity to improve EIA effectiveness would the three weaknesses

chosen in Question 9 be your main priorities?

Yes No

If No, what would be your main priorities?

.....  
 .....

7. Do you feel current EIA practice is effective at:

*For each option please tick the box that you feel most fits your view*

	Strongly Agree	Agree	Strongly disagree	Disagree
Helping decision makers				
Helping developers				
Reducing environmental impacts				
Contributing to sustainable development				

Part 3. Evaluating the quality of environmental impact statements

Definitions of rating categories

Satisfactory – good enough performance with minor deficiencies

Partially satisfactory – performance with some omissions and deficiencies

Unsatisfactory – performance with significant weakness

Evaluation Criteria	Level of Application		
	satisfactory	Partially satisfactory	unsatisfactory
Do the relevant environmental impacts of all significant actions assessed?			
Is there reasonable consideration of alternative actions in the EIA process?			

Does the screening of actions for environmental significance take place?			
Does scoping of the environmental impacts of actions take place and specific guidelines produced?			
Do EIA reports meet prescribed content requirements?			
Are EIA reports publicly reviewed and do proponents respond to the points raised?			
Are the findings of the EIA report have a central determinant of the decision on the action?			
Are mitigation measures of action impacts considered at the various stages of the EIA process?			
Do monitoring and auditing of the EIA system carried out?			

Part 4. Implementation of mitigation measures

Definitions of the rating categories:

Excellent– thoroughly and completely performed. Good – minor omissions and deficiencies.

Satisfactory – some omissions and deficiencies. Poor – significant omissions and deficiencies. Very poor – fundamental flaws and weaknesses

No opinion – insufficient basis/experience on which to judge.

Question/Criteria	Rating of the criteria met				
	Excellent		Satisfactory		No opinion
Are environmental management actions sufficiently incorporated in the project documents, so that proponents understand what is expected of them in the environmental area?					
How well are the mitigation measures of significant environmental impacts usually implemented?					
Are the mitigation measures applied at the right time and sufficiently integrated with project activities?					
submission of regular monitoring results by the proponents					
access to the results of the compliance monitoring and enforcement program by the public					
Consideration of cumulative impacts					
ZEMA regularly carries out environmental audits/inspections at project sites					

**Thank you for your time**

### **Appendix 3 - Interview Schedule for neighboring communities to the project**

#### **Dear respondent;**

My name is Patricia Mwelwa, a master's student at the university of Zambia carrying out a study on the "*Effectiveness of Environmental Impact Assessment (EIA) in Zambia using a case of the Chilanga Cement Plant*". To achieve this, I have developed this interview schedule which will take a maximum of 5 minutes of your time and the information will be invaluable to my dissertation. Please note that this study is not an investigation into any activities of your daily life but is purely academic and any responses obtained will be treated with confidentiality. Kindly respond truthfully.

#### **Section-I**

1. What is the level of education?

Primary      Secondary      Tertiary      None

Occupation:

Farming      Labourer      Private Service      Government service Business

Any other \_\_\_\_\_

2. Do you know what an EIA is? \_\_\_\_\_

---

#### **Section-II**

1. How did you come to know about the Lafarge Cement project?

2. Were you directly invited for participation during public hearing?

3. Did you understand the language of public notice and hearing?

4. How should the stakeholder be informed about development projects?

5. Was the EIA report easily accessible?

6. Did the EIA report contain sufficient information about the project and its impacts in a manner understandable to you?

#### **Section- III**

1. How does the Lafarge Cement project impact on the environment?
2. Are you involved in looking for solution to reduce the negative impacts on the environment?
3. How have you benefited from your neighboring industrial project?
4. Have you lives been affected by your neighboring industrial project?
  
6. What do you think should be done to provide environmental information to the general public?

**Thank you for tour time**

#### **Appendix 4 - Interview Schedule for ZEMA**

My name is Patricia Mwelwa, a master's student at the university of Zambia carrying out a study on the "*Effectiveness of Environmental Impact Assessment (EIA) in Zambia using a case of the Chilanga Cement Plant*". To achieve this, I have developed a set of questions which will take a maximum of 5 minutes to answer 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. Kindly respond truthfully.

Thank you in advance for your time.

#### **PART1**

This interaction seeks your critical assessment of the implementation of mitigation measures identified during the EIA process, with reference to this project. 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.

1. What are your major roles regarding implementation of EIA mitigation measures?
2. Do the mitigation measures sufficiently address the anticipated impacts?
3. How do you deal with the unforeseen impacts?
4. Are the recommended mitigation measures achievable and cost effective?
5. How often is environmental audit carried out in your project?
6. How often does ZEMA 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?

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 5 – Interview Schedule for EIA Practitioners**

My name is Patricia Mwelwa, a master's student at the university of Zambia carrying out a study on the “*Effectiveness of Environmental Impact Assessment (EIA) in Zambia using a case of the Chilanga Cement Plant*”. To achieve this, I have developed a set of questions which will take a maximum of 5 minutes to answer 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. Kindly respond truthfully.

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? Any other comments.

## **Appendix 6: Interview Schedule for the Factory Manager**

Dear respondent;

My name is Patricia Mwelwa a master's student at the university of Zambia carrying out a study on the "Effectiveness of Environmental Impact Assessment (EIA) process in Zambia a case of the Chilanga Cement plant. To achieve this, I have developed a set of questions which will take a maximum of 5 minutes 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. Kindly respond truthfully.

Thank you in advance for your time.

### **1. The EIA process of the Chilanga cement plant**

Details of the new and old plant in terms of the following aspects

- Size of the plants (area occupied)
- Product produced (cement)
- Level of production (how many tones)
- Possible areas of impact (population around, environment)

### **2. Performance of the plants (old and new)**

- A proxy of whether or not EIA is having the desired impacts
- Air and dust emissions from the two plants (Differences in terms of meeting statutory requirements)
- What accounts for the differences (Implementation schedule of the mitigation measure)?
- Stack emissions for the old and new plant

**OBSERVATION SHEET FOR IMPLEMENTATION OF MITIGATION MEASURES**

**ENVIRONMENTAL MEDIUM**

1. Energy Consumption (dry process).....  
.....  
.....
2. Air pollution (Control of emissions using the pulse jet bag filters, fabric bag house filters).....  
.....  
.....
3. Noise pollution.....  
.....  
.....
4. Land pollution (Generated waste to be stored in well secured containers ).....  
.....  
.....  
.....



THE UNIVERSITY OF ZAMBIA  
SCHOOL OF NATURAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

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17<sup>th</sup> July, 2023

Director  
Zambia Environmental Management Agency  
Lusaka

Dear Sir/Madam,

**RE: INTRODUCTORY LETTER FOR DATA COLLECTION - PATRICIA MWELWA**

This is to certify that Ms. Patricia Mwelwa (Student ID No. 21105934) is a postgraduate student in the Department of Geography and Environmental Studies at the University of Zambia. She is pursuing a Master of Science degree in Environmental and Natural Resources Management. As a requirement for this programme, Ms. Mwelwa is undertaking a research study on 'The Effectiveness of the Environmental Impact Assessment in Zambia: A case of Chibanga cement Plant'.

The purpose of this letter is to request for your assistance in her data collection exercise by giving her any data she may need; allowing her access to your library/information facilities for reports, documents and other data relevant sources; All sources of data will be specifically acknowledged in the dissertation to be produced at the end of the research. Because the exercise is for academic purposes, the report to be produced will have no commercial value.

Your usual support is appreciated.

Progress. H. Nyanga (PhD)  
HEAD, DEPARTMENT OF GEOGRAPHY & ENVIRONMENTAL STUDIES

OLYMPIA PARK SECONDARY SCHOOL BOX 31832 KWACHA ROAD

LUSAKA

4<sup>TH</sup> September, 2023

THE CORPORATE AFFAIRS MANAGER CHILANGA CEMENT PLANT

Dear Sir/Madam

REF: APPLICATION FOR DATA COLLECTION AT CHILANGA CEMENT PLANT

Reference is hereby made to the above captioned. I am a student at the University of Zambia (UNZA) pursuing a master of science in Environment and Natural Resources Management. My topic of study is an effectiveness of the Environmental Impact Assessment (EIA) in Zambia using the Chilanga Cement Plant as a case study. Find attached an introductory letter from UNZA directed to ZEMA, and my ethical clearance from the school approving my study and allowing me begin my data collection. Am unable to present an introductory letter directed to Chilanga because the Head of Department is out of the office. However, I believe the documents provided are sufficient.

Find attached the approval letter, introductory letter and the interview schedule. Yours

sincerely

Patricia Mwelwa 0773505270

[Patriciamwelwa33@yahoo.com](mailto:Patriciamwelwa33@yahoo.com)



**THE UNIVERSITY OF ZAMBIA**  
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**APPROVAL OF STUDY**

*IORG No. 0005376*  
*NASREC- IRB No. 00006465*

17<sup>th</sup> July, 2023

**REF NO. HSSREC-2023- MAY - 035**

Ms. Patricia Mwelwa,  
The University of Zambia  
School of Natural Sciences,  
Department of Geography and Environmental Studies,  
P.O. Box 32379  
**LUSAKA**

Dear Ms. Mwelwa,

**RE: "THE EFFECTIVENESS OF THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS IN ZAMBIA: A CASE OF CILANGA CEMENT PLANT"**

Reference is made to your protocol dated as captioned above. NASREC resolved to approve this study and your participation as Principal Investigator for a period of one year.

REVIEW TYPE	ORDINARY REVIEW	APPROVAL NO. NASREC-2023—MAY- 035
Approval and Expiry Date	Approval Date: 17 <sup>th</sup> July , 2023	Expiry Date: 16 <sup>th</sup> July, 2024
Protocol Version and Date	Version - Nil,	16 <sup>th</sup> July, 2024
Information Sheet, Consent Forms and Dates	<ul style="list-style-type: none"><li>English,</li></ul>	To be provided
Consent form ID and Date	<ul style="list-style-type: none"><li>Version - Nil</li></ul>	To be provided
Recruitment Materials	<ul style="list-style-type: none"><li>Nil</li></ul>	Nil
Other Study Documents	<ul style="list-style-type: none"><li>Interview Guide.</li></ul>	

*Towards Improving Service and Excellence in High Education Beyond Fifty Years*

Conditions will apply to this approval;

Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to. If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.

#### Conditions of Approval

- No participant may be involved in any study procedure prior to the study approval or after the expiration date.
- All unanticipated or Serious Adverse Events (SAEs) must be reported to NASREC within 5 days.
- All protocol modifications must be approved by NASREC prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.
- All protocol deviations must be reported to NASREC within 5 working days.
- All recruitment materials must be approved by NASREC prior to being used.
- Principal investigators are responsible for initiating Continuing Review proceedings. NASREC will only approve a study for a period of 12 months.
- It is the responsibility of the PI to renew his/her ethics approval through a renewal application to NASREC.
- Where the PI desires to extend the study after expiry of the study period, documents for study extension must be received by NASREC at least 30 days before the expiry date. This is for the purpose of facilitating the review process. Documents received within 30 days after expiry will be labelled "late submissions" and will incur a penalty fee of K500.00. No study shall be renewed whose documents are submitted for renewal 30 days after expiry of the certificate.
- Every 6 (six) months a progress report form supplied by The University of Zambia Natural and Applied Sciences Research Ethics Committee as an IRB must be filled in and submitted to us. There is a penalty of K500.00 for failure to submit the report.
- When closing a project, the PI is responsible for notifying, in writing or using the Research Ethics and Management Online (REMO), both NASREC
- and the National Health Research Authority (NHRA) when ethics certification is no longer required for a project.
- In order to close an approved study, a Closing Report must be submitted in writing or through the REMO system. A Closing Report should be filed when data collection has ended and the study team will no longer be using human participants or animals or secondary data or have any direct or indirect contact with the research participants or animals for the study.
- Filing a closing report (rather than just letting your approval lapse) is important as it assists NASREC in efficiently tracking and reporting on projects. Note that some funding agencies and sponsors require a notice of closure from the IRB which had approved the study and can only be generated after the Closing Report has been filed.
- A reprint of this letter shall be done at a fee.

All protocol modifications must be approved by NASREC by way of an application for an amendment prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address or methodology and methods. Many modifications entail minimal risk adjustments to a protocol and/or consent form and can be made on an Expedited basis (via the IRB Chair). Some examples are: format changes, correcting spelling errors, adding key personnel, minor changes to questionnaires, recruiting and changes, and so forth. Other, more substantive changes, especially those that may alter the risk-benefit ratio, may require Full Board review. In all cases, except where noted above regarding subject safety, any changes to any protocol document or procedure must first be approved by NASREC before they can be implemented.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above indicated address.

On behalf of NASREC, we would like to wish you all the success as you carry out your study.

Yours faithfully,

*Dr. M. Kaonda*

VICECHAIRPERSON

THE UNIVERSITY OF ZAMBIA NATURAL AND APPLIED SCIENCES RESEARCH  
ETHICS COMMITTEE - IRB

CC: Director, Directorate of Research and Graduate Studies  
Assistant Director (Research), Directorate of Research and Graduate Studies  
Assistant Registrar (Research), Directorate of Research and Graduate Studies