COPYRIGHT AND CITATION CONSIDERATIONS FOR THIS THESIS/ DISSERTATION

- Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

- NonCommercial — You may not use the material for commercial purposes.

- ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

How to cite this thesis

AN ASSESSMENT OF ENVIRONMENTAL IMPACTS OF BUILDING CONSTRUCTION ACTIVITIES: CASE STUDY OF REPUBLIC DEMOCRATIC OF CONGO TOWN OF KINSHASA

By

MBUYAMBA JEAN PAUL MBALA

A DISSERTATION

Submitted in satisfaction of the necessities for the degree

MASTER TECHNOLOGY

In

UNIVERSITY OF JOHannesBURG

CONSTRUCTION MANAGEMENT

In the

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

At the

UNIVERSITY OF JOHANNESBURG

SUPERVISOR: PROF.C.O. AIGBAVBOA
AN ASSESSMENT OF ENVIRONMENTAL IMPACTS OF BUILDING CONSTRUCTION ACTIVITIES: CASE STUDY OF REPUBLIC DEMOCRATIC OF CONGO TOWN OF KINSHASA

MBUYAMBA JEAN PAUL MBALA

A DISSERTATION submitted in satisfaction of the prerequisites for the honor of the degree Masters Technology in Construction Management in the Faculty of engineering and the built environment, Department of Construction Management and Quantity Surveying at the University of Johannesburg, Republic of South Africa.

JOHANNESBURG, MARCH 2015
DECLARATION

I, MBUYAMBA MBALA JEAN PAUL, hereby declare that this dissertation is the result of my own investigation and research, except to the extent demonstrated in the references and by comments incorporated into the body of the report and that it has never been presented anywhere else for a similar purpose. It was submitted to the University of Johannesburg (Department of Quantity Surveying and Construction Management), as a requirement to obtain a MAGISTER TECHNOLOGIAE degree in Construction Management.

Signature

Date

University of Johannesburg,

Doornfontein Campus
ACKNOWLEDGMENTS

My gratitude to the God Almighty for guiding me this far in life. Without Him, I would not have been able to do anything. I am additionally appreciative to Him for giving me the strength to conduct this research study. I wish to express my earnest thanks and gratitude to my supervisor, Prof. Clinton Aigbavboa, for his professional and expert guidance throughout the course of this research study. Finally, I want to offer my sincere thanks to the Department of Construction Management and Quantity Surveying, University of Johannesburg, South Africa for giving me the chance to study at their institution.
DEDICATIONS

I dedicate this Dissertation to my parents, the Kapelo family, the Kabengele family, the Mudiayi family, the Kabena family, the Kasongo family, the Ilunga family, the Kabala family, and the Shabany family.
ABSTRACT

Construction is an economic activity that on the one hand puts at the disposal facilities and infrastructures and on the other hand, it is beneficial to society in some ways and harmful in others. This review was done to evaluate the significant impacts of construction activities in Kinshasa, which is the Democratic Republic of Congo capital and to propose measures for their mitigation. A number of impacts were listed from the literature only fourteen were highlighted. These impacts were further developed in six substantial group and were brought into the survey. Questionnaire were send out to get the response, the distributed questionnaires were 200 it was made every which way, identities were kept privately among those were Architect, Quantity-Surveyor, Civil Engineer, Project Manager, Construction Manager and Other construction practitioners.

According to the study results, impacts were listed as followed time and cost aspect followed by Reliability of project, Accessibility to resources, Easy and fair communication. The study recommends that stakeholders in the industry should implement a successful model and also develop a framework on how to assist collaboration between clients, design team and the contractor either way on one virtual desk so that they should have a proper and effective implementation in the construction industry.

Keywords: Construction activities, Negative impacts, Environmental assessment in Kinshasa D.R.Congo
TABLE OF CONTENTS

DECLARATION..............................................................................................................................................................................I

ACKNOLEDGEMENT......................................................................................................................................................................II

DEDICATIONS................................................................................................................................................................................III

ABSTRACT......................................................................................................................................................................................IV

TABLES OF CONTENTS......................................................................................................................................................................V

LIST OF TABLES ...........................................................................................................................................................................XIV

LIST OF FIGURES ..........................................................................................................................................................................XVI

MAPS..........................................................................................................................................................................................XVII

LIST OF ABBREVIATIONS..............................................................................................................................................................XVII

1  CHAPTER ONE: INTRODUCTION ................................................................................................ 20

1.1  BACKGROUND OF THE STUDY ............................................................................................................................... 20

1.2  PROBLEM STATEMENT ........................................................................................................................................... 21

1.3  AIM OF THE STUDY ............................................................................................................................................... 22

1.4  RESEARCH QUESTIONS ...................................................................................................................................... 22

1.5  OBJECTIVES OF THE STUDY ............................................................................................................................... 23

1.6  MOTIVATION FOR THE STUDY ............................................................................................................................. 24

1.7  RESEARCH METHODOLOGY AND DESIGN ........................................................................................................... 25
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.7.1 RESEARCH METHODOLOGY</td>
<td>25</td>
</tr>
<tr>
<td>1.7.2 RESEARCH APPROACH AND DESIGN</td>
<td>25</td>
</tr>
<tr>
<td>1.7.3 SAMPLING AND DATA COLLECTION</td>
<td>26</td>
</tr>
<tr>
<td>1.7.4 LIMITATIONS</td>
<td>26</td>
</tr>
<tr>
<td>1.7.5 ETHICAL CONSIDERATION</td>
<td>27</td>
</tr>
<tr>
<td>1.8 OVERVIEW OF CHAPTERS</td>
<td>28</td>
</tr>
<tr>
<td>1.9 CONCLUSION</td>
<td>29</td>
</tr>
<tr>
<td>2 CHAPTER TWO: LITERATURE REVIEW: AN OVERVIEW OF THE ENVIRONMENTAL IMPACTS OF CONSTRUCTION ACTIVITIES</td>
<td>31</td>
</tr>
<tr>
<td>2.1 INTRODUCTION</td>
<td>31</td>
</tr>
<tr>
<td>2.2 GENERAL OVERVIEW OF THE CONSTRUCTION INDUSTRY</td>
<td>31</td>
</tr>
<tr>
<td>2.3 PROBLEMS FACE BY CONSTRUCTION INDUSTRY IN DEVELOPING COUNTRIES</td>
<td>36</td>
</tr>
<tr>
<td>2.4 IMPACTS OF CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT</td>
<td>39</td>
</tr>
<tr>
<td>2.4.1 IMPACTS OF CONSTRUCTION ON ENVIRONMENT</td>
<td>40</td>
</tr>
<tr>
<td>2.4.2 EXTENT TO WHICH THE CONSTRUCTION COMPANIES CONTRIBUTE TO THE IMPACT ON THE ENVIRONMENT</td>
<td>44</td>
</tr>
<tr>
<td>2.4.3 LEVEL OF CONCERN OF THE COMPANIES ABOUT IMPACTS ON THE ENVIRONMENT</td>
<td>45</td>
</tr>
<tr>
<td>2.5 EVALUATIONS OF CONSTRUCTION RELATED ISSUES</td>
<td>47</td>
</tr>
</tbody>
</table>
2.5.1 OUTPUT OF THE CONSTRUCTION ON THE ENVIRONMENT ................................................................. 49

2.6 FACTORS THAT AFFECT THE SUCCESS OF THE PROJECT .............................................................. 52

2.6.1 CAUSES OF THE POOR CONSTRUCTION ACTIVITIES ................................................................. 53

2.7 BARRIERS FACED BY THE CONSTRUCTION行業 IN ACHIEVING SUCCESSFUL PROJECT OUTCOMES 56

2.7.1 BARRIERS FACED BY CONSTRUCTION INDUSTRIES IN MITIGATING THE IMPACTS OF THE CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT ................................................................................................................................. 59

2.8 MEASURES TO REGULATE IMPACTS OF BUILDING CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT 61

2.8.1 MEASURES TO REGULATE BUILDING CONSTRUCTION ACTIVITIES ........................................... 63

2.9 CONCLUSION ..................................................................................................................................... 65

3 CHAPTER THREE: ENVIRONMENTAL IMPACTS OF THE CONSTRUCTION ACTIVITIES IN THE DEVELOPED AND DEVELOPING COUNTRIES ................................................................. 67

3.1 INTRODUCTION ................................................................................................................................. 67

3.2 UNITED KINGDOM ............................................................................................................................ 69

3.2.1 BACKGROUND OF CONSTRUCTION IN THE UK ........................................................................... 69

3.2.2 IMPACTS OF THE CONSTRUCTION ACTIVITIES IN THE UK ENVIRONMENT ................................. 71

3.2.3 CAUSES OF THE IMPACTS OF CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT IN THE UK ........ 73
3.2.4 CONSTRAINTS FACED IN MITIGATING CONSTRUCTION ACTIVITIES IMPACT ON THE UK ENVIRONMENT

3.2.5 MEASURES TAKEN TO REGULATE ENVIRONMENTAL IMPACTS DUE TO CONSTRUCTION IN THE UK.... 76

3.2.6 LESSONS LEARNT ................................................................................................................................................ 78

3.3 SOUTH AFRICA ..................................................................................................................................................... 80

3.3.1 BACKGROUND OF THE CONSTRUCTION INDUSTRY IN SOUTH AFRICA ...................................................... 80

3.3.2 IMPACTS OF CONSTRUCTION ACTIVITIES IN SOUTH AFRICAN ENVIRONMENT ......................................... 82

3.3.3 CAUSES OF ENVIRONMENTAL IMPACTS OF THE CONSTRUCTION ACTIVITIES IN SOUTH AFRICA ........ 84

3.3.4 CONSTRAINTS FACED IN MITIGATING CONSTRUCTION ACTIVITIES IMPACTS IN SA ENVIRONMENT .... 85

3.3.5 MEASURES TAKEN TO REGULATE ENVIRONMENTAL IMPACTS IN SA ENVIRONMENT ............................. 87

3.3.6 LESSONS LEARNT ................................................................................................................................................ 89

3.4 CONCLUSION ........................................................................................................................................................ 90

4 CHAPTER FOUR: ENVIRONMENTAL IMPACTS OF THE CONSTRUCTION ACTIVITIES IN REPUBLIC DEMOCRATIC OF CONGO (D.R.CONGO) ................................................................. 93

4.1 INTRODUCTION .................................................................................................................................................... 93

4.2 NEGATIVE IMPACT OF CONSTRUCTION ACTIVITIES ON THE DR CONGO ENVIRONMENT (SUPPORT WITH ARGUMENT) ............................................................................................................. 95

4.3 MEASUREMENT OF CONSTRUCTION RELATED ISSUES .......................................................................................... 97

4.4 MEASUREMENT OF DESIGN-RELATED FACTORS THAT AFFECT PROJECT SUCCESS .................................. 97
4.5 BARRIES FACED BY THE CONSTRUCTION COMPANIES IN ACHIEVING SUCCESSFUL PROJECT OUTCOMES ............................................................................................................................................................................ 100

4.6 MEASURES TO REGULATE BUILDING CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT .............................. 103

4.7 CONCLUSION ............................................................................................................................................................................. 105

5 CHAPTER FIVE: METHODOLOGY AND DATA COLLECTION ................................................................................................. 107

5.1 INTRODUCTION ........................................................................................................................................................................ 107

5.2 RATIONALE OF THE STUDY .............................................................................................................................................. 107

5.3 RESEARCH APPROACH AND DESIGN ............................................................................................................................ 108

5.4 RESEARCH AREA .................................................................................................................................................................... 110

5.5 TARGETED POPULATION .................................................................................................................................................... 111

5.6 SAMPLE .................................................................................................................................................................................... 112

5.7 DATA COLLECTION ............................................................................................................................................................... 113

5.8 INSTRUMENT OF DATA COLLECTION ................................................................................................................................ 114

5.9 PERIOD OF COLLECTION ..................................................................................................................................................... 116

5.10 METHODS OF DATA ANALYSIS ........................................................................................................................................ 117

5.10.1 MEANS ITEM SCORE (MIS) ........................................................................................................................................... 117
8 CHAPTER EIGHT: CONCLUSION AND RECOMMENDATION ......................................................... 196

8.1 INTRODUCTION ..................................................................................................................... 196

8.1.1 RESEARCH OBJECTIVE 1 .............................................................................................. 197

8.1.2 RESEARCH OBJECTIVE 2 .............................................................................................. 198

8.1.3 RESEARCH OBJECTIVE 3 .............................................................................................. 199

8.1.4 RESEARCH OBJECTIVE 4 .............................................................................................. 200

8.1.5 RESEARCH OBJECTIVE 5 .............................................................................................. 201

8.2 GENERAL RESEARCH CONCLUSION ............................................................................. 202

8.3 RECOMMENDATIONS ........................................................................................................ 203

8.4 AREAS FOR FURTHER STUDIES ..................................................................................... 206

9 REFERENCES ......................................................................................................................... 207

10 ANNEX 1 ............................................................................................................................. 217
## LIST OF TABLES

Table 6.1: Negative impacts of construction activities on the environment

Table 6.2: Level of concern about the impact on the environment

Table 6.3: General contractor related

Table 6.4: General consultant related

Table 6.5: General materials

Table 6.6: General labor

Table 6.7: General external factors

Table 6.8: Design designed

Table 6.9: Design handling

Table 6.10: Design for worker

Table 6.11: Scale design management

Table 6.12: Design site condition

Table 6.13: Design procurement
Table 6.14: Design by an external factor

Table 6.15: Barriers: rising costs

Table 6.16: Barriers: time

Table 6.17: Barriers: quality

Table 6.18: Measures to regulate

Table 6.2.1 Age group I

Table 6.2.1 Ethnicity II

Table 6.2.1 Years of experiences III

Table 6.2.1 Education qualifications IV

Table 6.2.1 Number of projects V

Table 6.2.2 Worker experiences I

Table 6.2.2 Highest qualifications II
LIST OF FIGURES

Figure 6.1: Respondents’ gender

Figure 6.2: Respondents’ age group

Figure 6.3: Respondents’ ethnicity

Figure 6.4: Respondents’ professional qualification

Figure 6.5: Respondents’ years of experience in the industry

Figure 6.6: Highest qualification

Figure 6.7: Sector in which the respondent is currently working

Figure 6.8: Respondents’ current number of projects
Maps 5.1: Map of the Republic Democratic of Congo, Kinshasa
LIST OF ABBREVIATIONS

CEQ: Commitment to Equity

CIBD: Construction Industry Development Board

CIRIA: Construction Industry Research and Information Association

CSIR: Council for Scientific and Industrial Researcher

D.R.C: Republic Democratic of Congo

DETR: Department of Environment, Transport and the Regions in Singapore

DTI: Department of Trade and Industry

EC: European Commission

ECA: Electrical Constructors Association

EIA: Environmental impact assessment

EIS: Environment impact statement

EMS: Emergency Management Services
FET: Further Education and Training

FIFA: Federation International de Football Association

GDP: Gross domestic product

H&S: Health and safety

ISO: International Organization for Standardization

LRS: Labor Research Service

M&E: Monitoring and evaluation

MDG: Millennium Development Goals

NAO: National Audit Office

ONS: Office for National Statistics

PWC: Price water house Coopers

RDP: Reconstruction and Development Program

RILEM: International Union of Laboratories and Experts in Construction Materials, Systems and Structures

XVIII
SA: South Africa

SEA: Strategic environmental assessment

US: United States

UK: United Kingdom

UNCHS: United Nations Center for Human Settlement

UNH: United Nations Habitat

USGBC: United States Green Building Council

VRV: Variable refrigerant volume

VSWC: Victoria Stormwater Committee

WCED: Western Cape Education Department

WRAP: Worldwide Responsible Accredited Production
1 CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Construction activities are among the principal processes/activities in the development of a country. Nevertheless, it has been reported that many temporary workers and private designers are endeavoring to consider the environment in their activities and exploring the concept of reusing building materials. Untimely, it could be on constructors because the vast majority of the positioned culmination time as their top need and give little consideration to the environment (Poon et al., 2001). Construction is not by nature an environmentally friendly activity (Li., 2010). So it might be admitted that because of its size the construction activities are a major user of energy and resources (raw materials) and at the same time a considerable polluter of the environment.

The determination of major environmental effects has necessitated the consideration of on-site measures with a specific end goal to organize building activities and processes in the achievement of the project. After observation, it might be seen that a very limited number of constructors and private developers give a thought to the environment and in building up the idea of recycling building. The construction industry is one of the biggest industries and at the same time among one of the industries which causes a considerable level of pollution (Horvath, 2004). For that reason, environment protection is a vital issue all over the world (Tse and Raymond, 2011).
The customers in the sectors assume a basic role in driving the construction industry to enhance its operation. Professional organizations and other industry bodies can introduce a sense of accountability among industry participants by stipulating adequate guidelines of conduct and setting up a steady administrative structure (International Organization for Standardization ISO14000 and 14001).

The level of information and consciousness of project participants, particularly Project Managers, with respect to environmental impacts of construction procedures, should be enhanced. Gangolells et al. (2011) concurred with Zolfagharian (2012) on this point and asserted that enhancing the recognizable proof of the major environmental impacts of construction procedures will help to improve the adequacy of environment management. Unfortunately, developing nations are experiencing the restricted access on scientific data about the impacts of building materials and technologies on the environment and it is hard to settle on choices aiming at decreasing such impacts (Pittet and Kotak, 2009).

1.2 PROBLEM STATEMENT

Most of the Congolese construction companies’ projects are facing numbers of barriers to the achievement of construction activities in their process. However, in previous decades, urbanization along with extraordinary urban development has caused negative impacts in environmental issues in terms of human settlements, frameworks, infrastructure and socio-economic factors in D.R Congo. Hence, there is the need to find
solutions to factors that cause environmental, social and economic threats. The problem investigated in this research project was to determine the negative impacts caused by construction activities, evaluate their effects and further suggest measures of minimizing those effects for a constraint-free work plan.

1.3 AIM OF THE STUDY

This research aimed to survey the environmental impacts caused by construction activities in D.R Congo and suggest some ideas which will ultimately curb these adverse impacts on the environment. The provision of this insightful database is a step forward in the construction industry at large.

1.4 RESEARCH QUESTIONS

The following set of questions was utilized to guide the integrated study of the assessment of environmental impacts of building construction activities:

1. What are the negative impacts of building construction activities on the environment?

2. What are the causes of poor construction activities that affect the environment?

3. What are ways to mitigate the impacts of building construction activities on the environment?
4. What are the barriers faced by construction companies in achieving successful project outcomes?

5. What are the measures that can be taken to minimize the environmental impacts of building construction activities?

Because of the multiplicity of research questions and the various sources of information required for answering these questions, the data would be both quantitative and qualitative in nature.

1.5 OBJECTIVES OF THE STUDY

Construction projects have turned out to be one of the main forces for the national economy whose energy consumption, environment outflow, and social impacts are critical (Chang et al., 2011). The rules of sustainability have been seen as the reason for the increasing environmental impacts of construction activities. Thus the research objectives are the following:

1. To reconsider some of the research with regard to the negative impacts of construction, and outline a conceptual framework for an assessment of the negative environmental impacts of construction activities;

2. To provide a comprehensive review of major causes typically found in poor construction projects and suggest ways to deal with them in the future;
3. To explore ways to mitigate the unnecessary construction impacts due to incompetent planning and to control a condition that must be fulfilled before other things can happen or be done for the building construction process;

4. To determine the barriers faced by construction companies in achieving successful outcomes; and

5. To present some of the measures that could be taken to formulate regulations that could be implemented during the entire process of construction activities of projects.

1.6 MOTIVATION FOR THE STUDY

The motivation for conducting this study is that the data provided at the end of the study might contribute positively to future improvement in the construction activities and their environmental impacts before, during and after the process of any given construction projects.

The findings of this research may contribute towards a better understanding of the Environmental Impact Assessment (EIA) which may lead to minimizing the negative impacts and causes of environmental degradation. In addition, this study will suggest measures which may be considered in decision-making for sustainable economic growth, thereby improving the social and environmental wellness in the D R Congo.
1.7 RESEARCH METHODOLOGY AND DESIGN

1.7.1 RESEARCH METHODOLOGY

Research methodology clarifies the technique utilized as a part of completing the research. This section outlines the geographical area where the study was conducted, the research design and the population sample. The instruments utilized as part of gathering information and the methods implemented to maintain legitimacy and reliability of the instruments are likewise described.

1.7.2 RESEARCH APPROACH AND DESIGN

A questionnaire was used to obtain data from Architects, Quantity Surveyors, Civil Engineers, Project Managers, Construction Managers and personnel in the departments concerned such as infrastructure, environmental and cadaster. The questionnaire was drawn up to identify the negative environmental impacts that have to be assessed and measures to be implemented during the project for sustainable decision-making. Furthermore, the research intends to draw up a guideline for the professional in the domain in the execution of the entire process of the building project.
1.7.3 SAMPLING AND DATA COLLECTION

This study adopted the use of stratified random sampling which was limited in Kinshasa. Well, the annually graduated, on-retired workers and qualification make it complex and huge in the construction field.

That why the study has highlighted a specific subgroup of constructor professional who is located in the town of Kinshasa which is going ensured the presence of the key subgroups within the sample form the entire country.

The relationships that are existing among at least few subgroups were observed according to the representation it might be equally or gradually within the sample.

The questionnaires were used as an instrument of data collection from the respondents.

1.7.4 LIMITATIONS

The current study assessment was conducted in the Democratic Republic of Congo. The planned interviews and hard copies questionnaires were limited to construction professionals, including Architects, Project Managers, Construction Project Managers, Construction Managers, Quantity Surveyors, Civil Engineers and other related professionals constructor practitioners.
1.7.5 ETHICAL CONSIDERATION

The ethical consideration in this study can be considered as the obligations to the professionals whose work that has added to the study will be legitimately referred to and acknowledged. The obligation to the participants in the research questionnaires is that their information will be kept confidential and not utilized for any advancement purpose. Respondents interviewed had the right not to answer any questions that they were uncomfortable with and they were given the right to withdraw at any phase of the interview. Furthermore, the real names of the respondents will not be used without their consent and permission.

Researchers are responsible for guaranteeing that participants will not be harmed, that their privacy is maintained, and the participants have provided their informed consent.

Qualitative researchers do not have clear guidelines for administering their research activities.

Universities make use of a review board to choose which research activities to approve.
1.8 OVERVIEW OF CHAPTERS

The structure of the thesis is presented and the particular sections described are as follows:

Chapter one gives the background information on the research. It clarifies why this research was undertaken and how this research applies to D.R Congo. Chapter Two focuses on building a theoretical base for the research by examining the literature and previous research. Chapter Three presents the effects of the findings regarding the environmental issues in terms of mindfulness/awareness and sustainable construction practices. In addition, the role of architects and designers in one developing country and one developed country is discussed, as well as lessons learned. Chapter Four gives information on D.R Congo, and a statement model is analyzed with respect to the implementation of the conceptual framework in D.R Congo.

Furthermore, a delimitation of the research is made for a contribution on the field concerned. Chapter Five presents detailed approval processes and the methodology adopted in the validation procedure. It also provides the methods used and the tool for collecting data from the respondents in accordance with the reviewed literature. Chapter Six presents the findings of the questionnaires survey and the interpretation of these findings. After the qualitative and quantitative collection of data, the analysis and interpretation of data are represented by the use of an appropriate program. The targeted
sampled population in the study are architects, quantity surveyors, civil engineers, construction managers, construction project managers and other professionals that are involved in construction projects in the target area in D.R Congo. In Chapter Seven, a discussion of the results of the research is presented regarding an evaluation of the assessment of the environmental impact of building construction activities in Kinshasa in terms of the activities that have to be regulated by the construction activities and the implementation of the EIA.

The results are discussed in relation to the literature covered in Chapters Two, Three, Four and Five to ascertain whether the objective of the research matches the finding analysis conducted in Chapter Six. The discussion of the findings in this chapter is related to the questionnaires and will contribute to the current study. Chapter eight presents the conclusions and recommendations of the research study discussed in relation to the objectives of the study.

1.9 CONCLUSION

This chapter presented the study; the various components of the study, and a detailed exposition of the way it was carried out. Moreover, the research problems were formulated, and the research questions and objectives were highlighted. Furthermore, in this chapter, the purpose of the study was discussed, as well as an overview of all chapters which this research project comprises.
The following chapter reviews the literature regarding the current status of assessments of environmental impacts on construction activities.
2 CHAPTER TWO: LITERATURE REVIEW: AN OVERVIEW OF THE ENVIRONMENTAL IMPACTS OF CONSTRUCTION ACTIVITIES

2.1 INTRODUCTION

This chapter underlines the basic background information relating to the study and introduces the contents of this study, enabling the overall understanding of the study. It presents a theoretical overview of previous theories relating to the state of the construction industry with regard to factors affecting project success, the results obtained from this construction project of a successful construction project, and the use of E.I.A. systems in the environment and construction enterprises.

2.2 GENERAL OVERVIEW OF THE CONSTRUCTION INDUSTRY

The construction industry contributes to the improvement of society, yet at the same time, it is not an environmentally friendly activity in light of the fact that a considerable measure of issues may exist if the future and improvement of this industry are not planned (Shen, 2002). Without a doubt, industrialization is considered as the foundation of development because of its huge commitment to economic growth and human welfare, yet it results in unavoidable costs and issues as far as pollution of the air and water resources is concerned (Kannj and Achi, 2011). Thus it has been viewed that at the heart of each advancement, constitutes a powerful negative influence on the environment and adds to the construction industry’s production of waste.
There are differing views held by researchers. Construction waste can be characterized as the side effect produced and removed from construction, renovation and demolition construction or building sites and civil engineering structures (Cheung, 1993). Furthermore, Shen et al (2003) confirm that building material wastage is the difference between the estimation of materials conveyed to and accepted on sites and those materials appropriately utilized as determined and precisely measured in the work.

In the wake of evaluation of the amount of raw material used in an execution in the process of the construction activities and all its stages, the cost and the time have to be considered. As Serpell et al (1995) stated, construction industries, in the realization of buildings, have made cities dense and their level of growth is significant in the economy of a country. However, through site supervision might reduce the environmental impacts both on and off-site. Environmental clearance in the building sector is weak and ineffective. Furthermore, Formosa (1999) stated that wastefulness is the outcome in the utilization of equipment, materials, work, or capital in bigger quantities than those considered vital in the planning and construction of a building. It is imperative that construction organizations should prioritize minimizing the waste from production, benefiting from the reuse of salvage, and building sustainable structures (Dutta and Sengupta, 2014).

It was found that half of all non-renewable resources that humankind uses are utilized in construction, making it one of the primer maintainable industries on the planet. For the
sustenance and dynamism of livelihood, each developing society is described by the erection of either permanent or temporary structures for the purpose of shelter which is the second necessity of life (George, 2002). Humanity has spent the larger part of its existence attempting to organize the natural environment to satisfy its needs. Nowadays, the day-by-day activities are performed in and on the construction of some sort: we live in houses, we travel on roads, and we work and socialize in buildings of different types. Contemporary human civilization relies on buildings and what they contain for its continued existence, but the planet cannot support the present level of resources consumption related to them.

The construction industry in both developed and developing countries might be seen as that sector of the economy which, through planning, design, development, upkeep and repair, and operation, changes different resources into constructed facilities from residential to non-residential competence which plays a principal role during the time spent in development (Moavenzadeh and Rossow, 1975). In developing countries, as much as half of the entire construction productivity might be in structural building ventures i.e. transport services, power ventures, water systems, drainage, water supplies, and so forth. Housing makes up almost as much as a third of the entire production, and what remains is shared among the development of schools, industrial facilities, workplaces, inns, and hospitals, among others (Wells, 1986).
The partners in these development exercises incorporate proprietors, architects, engineers, quantity surveyors, project managers, construction project managers, and general contractors who include a special exchange with subcontractors, local subcontractors, selected subcontractors and all other project participants, for example, workers, plant operators, and so forth.

The construction industry is viewed as a player with a key role in the wide variety of economic and social needs it fulfills, and the significant commitment it makes towards the satisfaction of different real national objectives. Generally, it is an administration industry, procuring its data sources and productivities from sources outside its segment with which it regularly interacts, frequently in different ways (Salleh, 2009; Moavenzadeh and Rossow, 1975). The advancement of the construction industry is a basic driver which bolsters development as it contributes colossally to the gross domestic product where its ability and viability to meet the demands of the national economy for the physical infrastructure is a maker of economic execution (Tanzanian Construction Policy, n.d). Furthermore, it guarantees the following:

✓ Increased value of money to the industrial customers and to determine the liability in the conveyance procedure;

✓ The feasibility and competitiveness of household development organizations;
✓ Optimization of the roles of all members and partners through the method and technological advancement retraining.

The importance of construction derives from the part it plays in the formation of construction facilities and in national employment, which eventually assumes a basic part of a nation's development procedure. Rational measures of the role of the construction industry in the economy, as indicated by UNIDO (1993), incorporate the following:

✓ Construction is generally labor-intensive in that it utilizes a larger number of laborers per unit output than any other industry; consequently, it is an essential provider of employment;

✓ The percentage of commitment of the construction industry to the GDP is substantial. Its output commonly constitutes between seven to ten percent of the GDP;

✓ The construction industry is basic to infrastructure advancement and gives a sizable commitment to settled capital in respect to different industries;

✓ The financial commitments on new development seem to be higher in developing countries when contrasted with developed ones.
Over the most recent decades, various studies have researched factors which promote the successful completion of projects, especially those which influence venture achievement more than others (Salleh, 2009).

2.3 PROBLEMS FACE BY CONSTRUCTION INDUSTRY IN DEVELOPING COUNTRIES

The construction industry has a significant irreversible impact on the environment over an expansive scope of its range of activities on the site as well as operational activities, which impact environmental integrity according to Usher (1999). Furthermore, Levin (1997) underpins the view stating that they are immense contributors to the environmental decay. Clearly, activities are expected to make the built environment and construction activities manageable or sustainable.

The construction industry globally faces various challenges. However, those confronting developing countries are significantly more complex (Gale and Fellows, 1990; Ofori, 1990; Salleh, 2009). They are associated with socio-economic stress and the extended duration of resource deficiencies (Ofori, 2000). Salleh (2009) states that conditions of vulnerability and risk continue to confront the construction industry, yet have a tendency to be extreme in developing countries. These vulnerabilities and dangers include the following:
• Instability

Construction is one of the first industries to feel the impacts of the economic recession (UNIDO, 1993). This generally puts local contractors in a position where they cannot keep up and constantly need to have new staff in their employee as the volatility of the industry does not guarantee stability for any staff and workers under the contractor’s payroll.

• Scarce Resources

Many developing countries have natural resources in abundance; however, they are often continually threatened by a lack of resources such as money, skilled laborers, and important technology.

Unskilled workforce. In spite of the fact that labor is abundant in developing countries, there tends to be a lack of skilled labor (Moavenzadeh, 1984).

➢ Poor Infrastructure

Poor infrastructure decreases productivity. As per the World Bank (1997), up to fifteen percent of production is lost because of poor roads and storage facilities.

➢ Low levels of productivity and excessive wastages

Research in some developing countries shows that projects are often completed with an increase of up to 30 percent of the original contract price while the variation of orders results in a cost overrun of an extra 8.3 percent (Al Momani, 1996).
Furthermore, developing countries tend to need fundamental knowledge, finance, skills, and capability to help the advancement of their respective construction activities (Othman, 2013). Different factors which impede the pace of development, as per the NCC (2005), are the following:

✓ The limited ability of the local contractors and consultants because of scarce resources and lack of experience;

✓ Low profitability and quality;

✓ Low technical base;

✓ Inefficient and complicated procurement structures, corruption and financial mismanagement, corruption and monetary bungle in the public/private sector;

✓ Lack of supportive institutional mechanisms regarding the availability of financial credit, equipment for hire and expert advancement; and

✓ Poor working conditions, including low measures of security and occupational hazards on construction sites.

Those issues have increased as a result of technological advancement and industrialization that has recently been accomplished (Gulgan et al., 2008). In the past, researchers have demonstrated that the environmental focus in construction was more towards the material selection, structure design, and recycling of materials rather than on ozone-depleting substance emissions (Kim et al., 2012). It includes social, physical,
cultural, biological and economic factors which constitute the environments of humanity, the makers, and molders of the environment (Pillai, 2012).

2.4 IMPACTS OF CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

The construction industry has an important role in providing physical infrastructure to meet the growing societal needs. On the other hand, it produces detrimental impacts, such as different types of natural contamination and resources consumption (Ofori et al, 2000). The environmental results generated from the construction industry related to many aspects, as well as the following:

- Utilization of large amounts of energy during the handling of materials in the construction process and in the utilization of constructed structures;
- Dust and gas emissions released during the generation and transportation of materials and in some construction operations;
- Interruption of the lives of people living in the region of construction through traffic redirection, noise contamination, and others;
- Production of substantial volumes of waste;
- Wastewater release;
- Utilization of water resources;
- Contamination from building materials; and
- Land utilization;(BRAILE,1993)
Significant consumption of both renewable and non-renewable resources (Clements, 1996; Morledge and Jackson, 2001; Poon et al, 2001).

2.4.1 IMPACTS OF CONSTRUCTION ON ENVIRONMENT

Construction uses a considerable range of materials such as the aggregates occurring in their raw nature and requiring only limited processing. The transportation and the utilization of timber have direct and lasting environmental effects, while other materials undergo complex manufacturing processes, consuming energy and requiring transportation. According to the literature review, the process contributes to the depletion of raw and natural resources, and moreover, production waste needs disposal and produces atmospheric emissions.

Construction has a duty to contribute to the continuation of population growth and economic development while at the same time has to pay heed to the widespread social interests in environmental conservation- the goals of which have not been realized yet. Many researchers reported that only a small number of contractors and private developers spend efforts in considering the environment and developing the idea of the recycling of building materials (Lam, 1997). The reason is that the majority regards the completion time as their goal and pays little attention to the environment (Poon et al., 2001). on the other hand, it is clear that a considerable number of impacts on the environment as to be highlighted at this level such as: (the world wild institute, 2003).
Atmospheric emissions: Greenhouse gas emissions, emission of VOCs and CFCs

Water emissions: Water from excavation, water from cleaning tools, sanitary water

Waste generation: Excavated waste material, municipal waste, inert waste, ordinary waste, toxic waste

Soil alteration: Land occupancy, concrete release agent, cleaning agents, construction machinery waste

Resource consumption: Water consumption, electricity consumption, fuel consumption, raw materials consumption

Local issues: Dust generation from machinery, dust generation in earthworks, dust generation in cutting operations, noise and vibration generation, landscape alteration

Transport issues: Road traffic, interference in road traffic

Effects on biodiversity: Vegetation removal, loss of edaphic soil, potential soil erosion, interception of water bodies, interference with the ecosystems

Accidents and incidents: Fire outbreaks, breakage of service pipes, and breakage of receptacles.

2.4.1.1 A. ENVIRONMENT IMPACT OF CONSTRUCTION WASTE

Construction waste is becoming a serious environmental issue in many countries all over the world (Poon, 1993). The construction industry creates serious environmental impacts in comparison with other industries and yet it lags far behind in implementing
environmental management. It is also responsible for different types of wastes, the quantity, and quality of which depend on factors such as the stage of construction.

The study by Macozoma (2002) shows that certainly available statistics indicate the construction industry and its operation in the built environment being responsible for about 12 to 16 percent of freshwater consumption; 25 percent of wood harvested; 30 to 40 percent of energy consumption; 40 percent of raw materials extracted and 20 to 30 of greenhouse emissions. At the same time, the rapid growth of its economic expansion makes construction the largest market in the world and creates unprecedented opportunity in the construction industry.

The construction activities have become a serious problem linked to the material selection that influences the environmental impacts of construction. These relate to releasing into the environment and taking from the environment the following: building materials, energy, water, vegetation, construction waste, solid waste, sewage and surface drainage. The factors causing the level of impacts are heat and pollution which are the products of materials and the way they are processed. Similar materials might have significantly opposite environmental impacts, depending on the factors.

Necessary factors affecting the selection of residential construction materials are their durability compared to life cycle, lifecycle energy consumption, source and environmental
impacts of all component materials and processes, recycling potential, and the length required for the transportation of components.

2.4.1.2 B. SUSTAINABLE CONSTRUCTION

The well-known definition of sustainability is that of the World Commission on Environment and Development (1987) as “Development that meets the needs of the present without compromising the ability of the future generation so as to meet their own needs.” It aims at reducing the impacts that are encountered in the environment where a building is erected over its entire lifetime while minimizing its economic viability and the wellness and safety of those who live in it. An implementation of sustainable buildings starts with proper site location, including the reuse or rehabilitation of the existing building that has to be taken into consideration.

The increasing threat is that of freshwater resources. The use of water should be efficient, and the reuse or recycling of water should be practiced for on-site use when possible. Che Ani and share (2003). Buildings have to be constructed of materials that reduce life-cycle environmental impacts such as resources depletion, global warming, and human toxicity (Ortiza and sonnemannnc., 2009). Materials should be selected and used which have a low detrimental effect on human health and the environment in order to ensure the improvement of workers’ safety and health, reduced liabilities, reduced disposal costs, and the realization of the environmental targets (Zhang and Yang, 2001).
2.4.2 EXTENT TO WHICH THE CONSTRUCTION COMPANIES CONTRIBUTE TO THE IMPACT ON THE ENVIRONMENT

The environment has the following four categories of important threats: Materials as resource inputs and waste outputs; Water including emissions into water; Land including emissions into soils; and Carbon and air emissions.

In the evaluation of the overall environmental consequences, careful attention has to be focused on the interlinkages among the above-mentioned categories. Measures are going to be effective only when different types of environmental pressures allude to developments in the exploitation of natural resources such as materials, energy, water, and land which are inputs to the human activities (8th international conference on environmental compliance and enforcement, 2008). Similarly, for the substances released on the outputs side are greenhouse gas emissions, waste, air and water pollution. The social transformations are transported and converted in a variety of processes that bring about environmental changes. In turn, these lead to impacts on the social and economic functions of the environment, such as the provision of suitable conditions for the availability of resources, health, and biodiversity (EEA, 1999).

The environmental assessments involve a number of different environmental categories. In particular, the methodologies of the life cycle assessments (LCA) present an understandable consideration of the different environmental impacts of production and
consumption activities. Three areas have been identified in which the impacts occur, namely human health might negatively be affected, the natural environment (ecosystems) and the natural resources (Sala et al., 2012).

In order to measure environmental pressures and impacts of the construction, firstly, probably estimates ought to be based on the lifecycle assessment of the materials used. Secondly, possible estimates ought to be based on lifecycle assessment of water requirements. Thirdly, land utilization change might be more environmentally damaging in some places than others. Finally, where possible, estimates ought to be based on the lifecycle of greenhouse gas emissions and associated local pollutants.

2.4.3 LEVEL OF CONCERN OF THE COMPANIES ABOUT IMPACTS ON THE ENVIRONMENT

The presentation of an existing model on the causes and effects first level related to motives for environmental strategies; the second, environmental strategies, and the third one, the results of environmental strategies (Banerjee et al., 2003). Researchers have discussed four broad ranges of motives for environmental strategies such as regulation, expected competitive advantage, public interest and devoted management’s commitment.

The initial motive for companies’ environmental interests was as a result of regulations or governmental legislation. Those who make laws represent a powerful stakeholder team
that has influenced external political as well as economic forces on companies. They can regulate the product that has to be packaged, the channels of design and distribution of products, emission, and pollution control (Banerjee et al., 2003). However, governmental regulation is not implemented for all industries (Hoffman, 1999). On the one hand a company evaluates public interest and gauges the regulation expected and competes against a landscape that demands an understanding of political moderating, while on the other hand, a company has to respond to the external pressures by presenting a green picture to show their responsiveness to public interest or by developing and presenting environmental strategies to attract green clients (Banerjee et al., 2003)

Competitive advantage has to be expected as one of the motives for environmental strategies that arise from outperformance of a company’s belief of its competitors by differentiating products and services (Port and Van der Linde, 1995). Therefore, it has to be based on its previous environmental strategies which includes provision of buildings and infrastructures adapted to changing social and economic needs, meet global challenges such as energy security and climate change as well as to provide an attractive sector to work in, complete with excellent opportunities for career development, good pay, and improved health and safety.

However, the two dimensions of the corporate environmentalism are environmental orientation - which is the acknowledgment by managers of the reality of environmental problems facing the construction companies. Secondly, there is an environmental
strategy which might be understood as the extent to which environmental problems are integrated into construction companies’ strategic plans.

Undoubtedly, the statement of Neundorfer (2007) presents a process of reducing pollution and costs of material which his primordial as well as the improvement of the materials quality, diverse factors was recently incorporated into norms that should be profitable for the development. the companies attempted to augment customer satisfaction and loyalty which conducted into synergies between poor manufacturing and green manufacturing raise plant-level productivity, as well as revenues and market share, is the reverse logistics for remanufacturing and supply chain design are challenges increasingly met and turned into profitable outcomes (regular verification is costly).

2.5 EVALUATIONS OF CONSTRUCTION RELATED ISSUES

The productivity goal is to measure regularly the evaluation of the output in tracing the technical changes. However, the currently known possibilities of converting resources into outputs suitable to the economy (Grilliches, 1987) as well as in the advances in the design and quality of new vintages of capital goods and intermediate inputs. Hence, formally measured residual captures not only the factors but also a modification in capital use, learning-by-doing and measurement errors of every sort, even though, measurement of the productivity evolution in practice might be seen as a demand to locate real cost savings in production as stated by Harberger (1998).
The differentiation and identification of technical and efficiency changes are the principal focus of data envelopment analysis. Still, productivities measures are the key element for its assessment living standards such as income per person in an economy affected directly by single labor productivity and the value put on per hour worked. The potential output is an important measure of the development facilities of economies and of inflationary exigencies.

Because there are different measures of productivities, choosing between them depends on the purpose measured on productivities and on the data availability. It might be divided in to relating a measure of output to a single measure of input and relating a measure of output to a bundle of inputs as it is:

- **Contractor factor related**
  
  Rework due to errors during construction, poor execution, improper statements interpretation, frequent changes of sub-contractors, poor qualification of the contractor's staff and site mobilization (Wei, 2010).

- **Consultant factor related**
  
  Delay in approving major changes in the scope of work, unclear and inadequate details in the drawings, poor coordination, mistakes and inconsistencies in design documents, lack of experience, insufficient data collection and survey before design (Otim, 2014).

- **Materials factor related**
Delay in material delivery, lateness in material ordering, damage of sorted material while needed urgently, change of material types during construction, delivery of wrong material, ordering wrong material, inappropriate material storage, shortage of equipment and equipment breakdowns.

- **Labors factor related**

  Low productivity level of workers, the inexperience of workers, laziness in executions, shortage of labor and lack of communication among workers.

- **External factors related**

  Delay in obtaining a permit from the municipality, delay in performing final inspection and certification, effects of subsurface and ground condition, delay in providing services from utilities, natural disasters, change in economic factors, change in government guideline and laws, traffic control and restriction on sites (Aziz, 2013).

### 2.5.1 OUTPUT OF THE CONSTRUCTION ON THE ENVIRONMENT

The environmental impacts assessment is a very important tool to identify major reconstruction project impacts to ameliorate effectiveness of environmental management systems. Prevention of the environmental impacts of construction projects before the construction work leads to improvement of the performance of the environment on construction site. The literature review has demonstrated that construction causes great
impacts on the environment. It is imperative to assess the nature of the impact to the environment and take the necessary actions towards curbing the damage to the environment. It may vary from one country to another. The major impacts on the environment are namely: waste disposal, pollution, resource use and habitat destruction, desertification, soil erosion and material wastage, etc.

Uses of resources like timber and non-fuel materials lead to habitat destruction, loss of arable land, and loss of biodiversity, etc. The measurement of principal mitigation of the environmental impacts of the construction are noise, land use and recreation, hydrology and water resources, geological and soil, etc. which is determined by Gangolells et al, (2011). The studies made by Chen et al, (2005) present environmental impacts and about twenty-six subcategories of impacts were identified;

- **Public impacts:**

State hygiene condition, public health effects, social disruption.

- **Natural resources impacts:**

Transportation resources, energy consumption on the site, raw materials consumption, resources deterioration, electricity consumption.
➢ **Ecosystems impacts:**

Noise pollution, dust generation with construction machine, land pollution, waterborne, air pollution, operation with vegetation removal, emission of volatile organic compound, generation of inert waste, operation with high potential for soil erosion, water pollution, waste generation, dust generation, inert water, chemical pollution, landscape alteration, toxic generation, waterborne toxicities, greenhouse gas emission.

The following subcategories of environmental impacts across construction process which is related to contractor's factors, consultant’s factors, materials factors, labors factors, external factors:

➢ **Contractor-related factors**

Rework due to errors during construction, poor execution, improper statements interpretation, frequent changes of sub-contractors, poor qualification of the contractor's staff and site mobilization.

➢ **Consultant related factors**

Delays in improving major changes in the scope of work, unclear and inadequate details in drawings, poor coordination, mistakes and inconsistencies in design documents, lack of experience, insufficient data collection and survey before design.
> **Materials related factors**

Delay in materials delivery, lateness in material ordering, damage of sorted material while needed urgently, changes of material types during construction, delivery of wrong material, ordering of wrong materials, inappropriate material storage, shortage of equipment, equipment breakdowns.

> **Labors related factors**

Low productivity level of workers, the inexperience of workers, and laziness in execution shortage of labor, lack of communication among workers.

> **External factors related**

Delay in obtaining permits from the municipality, delay in performing final inspection and certification, effects of subsurface and ground conditions, delay in providing services from utilities, natural disasters, change in economic factors, change in government regulation and laws, traffic control and restriction on sites.

2.6 **FACTORS THAT AFFECT THE SUCCESS OF THE PROJECT**

The success of a construction project is influenced by different factors, some of which are design-related which occurred at the very beginning stage of the construction process. These factors necessitate a clear standard that projects their interests and views (Dvir et al., 1998). Therefore, revising the implementation of the set standard applicable for different projects might be impossible. In the last years. The struggle to locate critical
factors is a procedure that researchers are working on, namely; schedule and plans, top management support, project mission, technical tasks, clients’ consultation, monitoring and feedback, communication and troubleshooting, clients’ acceptance, etc.

Furthermore, the consideration of themes in order to determine success factors of projects: identifying/agreeing objects, cooperation, and communication, competencies of the project manager, timing, strategic of the project and top management support. These were listed by practitioner’s inputs, which are the preliminary empirical findings that show inconsistencies that could have a negative influence on the outcomes at the end of the project. Undoubtedly, when the occurrence of such issues appears, the project manager has to put himself in, in order to increase success probabilities by empowering previously indicated factors.

2.6.1 CAUSES OF THE POOR CONSTRUCTION ACTIVITIES

The causes that affect construction are, on one hand, usually based on the procedures and qualification of the workforces, as well as the relationship in the chain supply of the construction process, as defined by Meng (2012), and on the other hand, the harmony of the working condition, for instance: mutual objectives, gain pain sharing, trust, no-blame culture, performance measurement etc. Furthermore, these are explained for the acknowledgment of impacts and effects that might occur on the performance of projects.
in the construction industry. Obviously, project implementation is weighted based on triple parameters which are: cost, time and quality.

Generally, when construction performance is not as successful as we think, it might be due to poor reflection on the delivery and it is linked to time delay, cost overruns and quality defects (Meng, 2012). Mutual objectives encompass the change in relationships to a shared culture based on trust, dedication to the same goals and an understanding of each other’s individual expectations and values, as said by Bensen and Marshall (1999). However, interactions which have to be integrative are characterized by a cooperative way of acting, hence different business transactions search for an amicable way to achieve mutual focuses while haggling (Grover et al, 1996). Planning relational objectives might lower negative change of formal contractual principal and rules on people actions (Kadefos, 2005) and instead organize the objectives and goals of different part and their efforts on the same wave.

In theory, most teams in the construction projects link different participants from a variety of organizations which are gathering for a short-term and temporary arrangement (Baiden et al, 2006). Suggested by Bresnen and Marshal (2000), a project performance, in circumstances of cost, time, and quality might be sensationally improved if the involved parties take more collaboration methods of working, still before any interaction between teams to become one consulate team. For that matter, individual behavior has to be
studied and analyzed in more detail so as to understand how individuals contribute their unique skill-sets to form the whole (as part of a team).

Furthermore, teamwork and cooperation would provide a model for ensemble learning amid a project management and teamwork structure that would develop a conducive workflow structure by working as a whole (Gunasekaram and Li, 1998). Although, enthusiasm to communicate sincerely occurs after quite a long time (Gala and Luo, 2004). Almost all the project construction groups learn to part and share what they have as knowledge in that short space of the project time. Different cause of construction activities:

- **Design factors related**
  
  Frequent design changes, design errors, poor design quality, a wrong compilation of design, inexpert designer.

- **Handling factors related**
  
  Wrong material storage, poor material handling, poor quality of materials, equipment failure (breakdown), tools not suitable.

- **Worker factors related**
  
  Works mistakes, poor understanding of environmental assessment, lack of experience, shortage of skilled workers, a lot of overtime for the worker, poor communication between workers, poor communication between workers.
• **Management factors related**

Poor planning, poor supervision, lack of coordination among parties, non-availability of equipment, lack of environmental awareness.

• **Site factors condition**

The leftover material on site, poor site condition, waste pile over time, congestion of the site, lightning problem, crews’ inference.

• **Procurement factor factors related**

Ordering errors, shipment errors, and mistakes in quantity surveys, ignorance of specifications, waiting for a replacement.

• **External factors related**

Weather conditions, accidents, vandalism, unpredictable socioeconomic conditions, lack of law enforcement.

### 2.7 BARRIERS FACED BY THE CONSTRUCTION INDUSTRY IN ACHIEVING SUCCESSFUL PROJECT OUTCOMES

The wild criticisms of the construction industry were due to its fragmented approach to delivering a project and failing in the effectiveness of team making. As a consequence of the fragmented approach, a reduction of project delivery efficiency emerged Egan (1998), Egan (2002) and Anumba (1998). A poor execution has been given to an ongoing use of procurement practices that do not promote the integration of the clusters involved even
though the industry has been looking out for changes in the performance by introducing a different way for the improvement tools and techniques in delivering products. The moving of the industry from traditional modules operation towards more collective and integrated approaches was a challenge for the industry (Gunasekaran, 1998; Latham, 1994; Bourn; 2000).

Furthermore, latest articles and journals accelerate improvement in putting the UK in a situation where challenges of the construction industry have to be mitigated by putting in place systems and methodologies that are able to present in advance the result to clients. Likewise, reports proposed process and crew implication as a key driver of improvement, which is necessary for the maturity of the industry and its success (Egan, 2002). The attempts of teams' implication in the industry have been largely focusing on changing project procurement and delivery processes (Baiden, 2003). Conception and reforming of strategies and partnering organizations aimed at encouraging crew formation, communications working and retention of the workforce, have been utilized to attempt to implement the construction projects output from the crew (Anumba et al., 2002).

Furthermore, the integration models of procurement, for example, design as well as building, that gathered design and construction process of projects, have also been introduced (Bourn, 2001) and (Stutz, 2000). However, although with a positive mindset, the achievement of the construction design process attempts had not fully reached the
expectation for its success (Moore et al., 1999). A perceptible by touch examples of where the integrated design of construction was achieved in the industry are few (Vincent et al., 1995) and (Vyse, 2001). In theory, the poor execution has been temporarily attributed to the inability of the project team involved to work together effectively (Anumba, 1998). In conclusion, the study was focused on three barriers which are:

- **Rising costs**

  The rising costs of influencing barriers in construction activities or projects can be attributed to: increase in wages, lack of materials and supplies, long quality equipment, inflation, amongst other factors.

- **Time**

  Slow delivery of materials and supplies, government restraints, changes, delays in the design schedule and delay in the construction schedule are some of the key components that influence time where barriers are concerned.

- **Quality**

  Poor quality results in poorly executed works and poses a huge barrier to the successful execution of projects. Some of these factors which hinder good quality projects are Poor design criteria, lack of inspection, lack of skilled workers, poor quality supervision and lack of finance and availability of materials.
2.7.1 BARRIES FACED BY CONSTRUCTION INDUSTRIES IN MITIGATING THE IMPACTS OF THE CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

They are a huge number of challenges faced by the construction management; some of them are more recent and others have been plaguing the industry for centuries (Donald et al., 1992). A significant portion of these challenges might be attributed to incorrect construction procedures while others are connected indirectly to the flow of construction project; making the process surrounding the project difficult to manage properly.

Construction problems that are significant contributors to the challenges faced by construction professionals include; labor values, safety, time constraints, and complexity of the nature of the work. Still, some of them are related to construction challenges from the construction manager and others who are part of the organizational landscape, including legal problems, regulation of the government, concerns about the environment and the pressures of socio-politics (Dunham 1986). Hence, the success many projects are evaluated by reaching the criteria benchmarked for cost, time, safety, resource allocation, and quality as presented by owners. This might be achieved through the expenditure of resources that form part of input in the projects: Quality, cost, time, scope, and safety requirement. The construction manager has to control, deflect, or mitigate effects of occurrence or situations that might affect the success of the projects.
✓ Construction work overall is complex sequences of interdependent activities that few ought to say is a failure. Construction differs uniquely from other types of projects and industries. To name just a few differences that impact the activities within the industry landscape:

✓ The work is often seasonal (this differs from manufacturing which offers a more long-term possibility for employees/workers)

✓ Each project is unique

✓ Involves controlled sites with various access issues

✓ The process is not as predictable

✓ It is not easy to apply automation to meet potential unforeseen conditions

✓ The condition might make the costs to vary, thereby deviating from original budgetary provisions made

✓ Difficulty of management

✓ Supplying utilities and other resources

✓ Slow adoption of the technical innovations
✓ Qualify worker gives successful, mind-boggling size of the product, cost, and variety.

Usually, works are not performed in a controlled environment; therefore the impacts are huge due to weather and other environmental conditions.

2.8 MEASURES TO REGULATE IMPACTS OF BUILDING CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

The norms and standard of construction practice provide manuals/set standards on the environmental clearance of large construction projects, the environmental sector principle, broad framework of notification, application for prior environmental clearance and the process for new projects (Mohanty and Rao. 2004). Suitable site planning involves a myriad of components that contribute to the level of planning thereof: scope of work, date selection, concerns, guidelines/recommendations for site selection and site analysis.

On one hand, environmental management is one of the main components amid all project supervisions. On the hand, it is going to ensure the realization of an environmental protection measure amid the project. Whereas major environmental impacts appear as a result of project construction, the supervising of the engineer is going to present mitigation measures, which have to be exercised after agreed upon by all parties involved. Furthermore, the following aspects are covered (Sun, 2009): Protection of surface water,
control of dust, toxic and hazardous gases, control and monitoring of noise, erosion prevention heritage and construction of facilities for environmental protection.

The environment monitoring on the project when it is considered to have tangible impacts on the environment or those impacts is going to last long. In theory, management should be carried out before the project goes ahead as regards principle factors which could be affected (Glasson, 2013). Therefore, an EIA for a small project with few significant environmental impacts could easily be completed by constructors with specialist support where required.

Generally, a large environmental impact assessment team might probably compromise personnel, from the project developer, project sponsor, relevant government authorities, and quite often, external consultants, as well as, an appointment of a coordinated EIA (Rotich, 2011). This appointment firstly ensures that all disciplines are working in a coordinated direction and that information is exchanged and all relevant documentation saved. Secondly, the EIA team acts as the contact point with the project development management crew. Thirdly, it is imperative to organize and collate team members’ inputs to produce the necessary EIA documentation for the management authorities or the public (Lester, 2006).
2.8.1 MEASURES TO REGULATE BUILDING CONSTRUCTION ACTIVITIES

The measures and the regulations might be done only when the agent and client work together for a performance of an efficient construction final deliverable. Firstly, any aspect of the work being performed will require a certain level of knowledge that will deliver an efficient final product, trained and experienced workers where applicable, for the qualifications, which is specific to the work or task. Secondly, being familiar with the act and with applicable regulations made under the acts will facilitate effective operation of works and contribute to timely deliverables. Examples of components that form part of the building regulation process:

Construction Manager has to be in connection with either the construction, the erection, alteration, renovation, repair, demolition, dismantling or addition to a building and any similar structure or the construction.

As we might see, it is the responsibility of the construction manager to follow steps which are: moving of earth, clearing of land, the making of excavation, pilling, any similar civil engineering structure, type of work as well as Contractor work permit.

The erections, maintenances, and demolitions of any sort of building have to be controlled, the pull-down or knockdown of a structure or part thereof by way of manual labor, machinery, and design (Aiyetan et al., 2001).
Before any tender, a report has to be available to the client showing up-to-date health and safety data about design relevant to a structure that might affect the construction work and the geotechnical aspects where it is supposed to be. The structural reinforcements and anchors of the structure have to be designed, a document briefly explaining the dangers and hazards related to the construction project must be made available the introduction of any design necessitating the use of dangerous procedures or materials, which may otherwise be avoided by modifying the design or by substituting materials, must be taken into cognisance. If the designer is not so mandated, they stop any contract that is not in accordance with the relevant design health and safety and facilitate the introduction of a reasonable practicability (Made, 2002).

Reasonable practicability measures listed below are some of the measures the designed should take to ensure adherence to health and safety measures: Listed among others are as followed:

- Appointment of an experienced contractor
- Adequate planning
- Decrease variation of orders
- Completed design at the time of tender
- Allocation of adequate projects duration
- Proper pre-contract planning
✓ Use of up to date technology
✓ Appointment of highly experienced technical consultant
✓ Appointment of the high experienced committed design team
✓ Proper project implementation and management
✓ Reliable pre-contract estimates
✓ Comprehensive client’s brief development
✓ Adequate designs
✓ Adequate pre-contract project coordination
✓ Good workmanship
✓ Employment of experiences site workers
✓ Timely supply of materials
✓ Ordering the right materials
✓ Proper implementation of the local regulation
✓ Use of appropriate construction methods

2.9 CONCLUSION

The chapter highlighted different definition of terms that provided a good understanding of the role of the construction industry and the challenges which confront it and its
development thereof. In addition, this chapter reviewed literature which explored concepts of deliberate and tactical efforts to improve the efficiency of the execution of construction projects.

The concept of environmental impact assessment (EIA) in construction was discussed and how beneficial products such as enterprise resource planning could be with regard to the assessment of manageable factors contributing to its efficiency. The following chapter will review the literature of the United Kingdom, representing a developed country and South Africa representing a developing country. The chapter will explore the challenges faced by the construction industry in both South Africa and overseas.
3 CHAPTER THREE: ENVIRONMENTAL IMPACTS OF THE CONSTRUCTION ACTIVITIES IN THE DEVELOPED AND DEVELOPING COUNTRIES

3.1 INTRODUCTION

Environmental awareness has gained momentum, the world over. As it stands, it is gaining momentum with the awareness of the effects of negative impacts on the environment due to construction activities, water utilization and waste disposal (Menah, 2006). In particulate developed countries dealt with the report preparation of the environmental impacts, which place them on the maps. On this days differently to developing countries the report has been confidential (Bisset, 1992). In particular to, the EIA report are used friendly which made it stronger on alternative, scoping, prediction, attribution of significance, and the justification of proposals (Lee, 2000). Apparently, the environmental impacts assessment report are available to the public and libraries are more close to people.

The humane resources a well-trained and financial resources are allocated often leads to preparation of inadequate and relevant EIA report in developed countries (Coa, 2007). Even though, environmental condition is some of the time note favorable in areas the environmental assumptions, models and standards are adapted to the situation (Anderson, 2006). Where by, baseline socio-economic and environmental data has time accuracy, it is easy to obtain result or existing data for previous work in developed countries in conclusion, the significance attached to particular environmental
impacts may be either lessor are linked to norms an regulation and culture is not really affecting any of this in the developed countries (Boyle, 1998).

In addition, consultants have to be or not depend but have to be constrained by fixed budgets, the exploration of the EIA has to be followed according to the methodologies, George (2000) clarifies that factors such climate, ecology, population density and social structure influence the choice of impacts prediction technique, also evaluation of significance and the design of mitigation measures in EIA. Despite the fact that this has turned out to be acknowledged as a fundamental element of development, without a doubt, the increase in human net wealth and great equity for satisfying essential needs has been met and has provided a cushion for future generations.
3.2 UNITED KINGDOM

3.2.1 BACKGROUND OF CONSTRUCTION IN THE UK

Construction in the United Kingdom experienced an exponential growth during the eighteenth century when the revolution took place. This growth resulted in new scale industrial developments (Oluwole, 2011). Paradoxically, the eighteenth century made no major innovations. In the nineteenth century, however, remarkable strides were made in the development of construction materials; cast iron, fashioned iron and later steel.

It accelerated the growth spurt of the century and resulted in the erection of new structures such as; railroads, bridges, scaffolds, building outlines, glass utilized for steel large glaze envelopes, Portland cement and with its concrete and later fortified solid structures (reinforced concrete structures) (Ngowi, 2005). As stated by Mawhinney (2001), it became evident that urgency in the development of building equipment to be used to work in tandem with the newly developed structures was needed in the industrials sectors. Building equipment such as lifts, boilers, radiators, and pipes was produced.

A government publication, a better quality of life. A strategy for sustainable development for the United Kingdom published in May 1999 was taken after, with a second in April 2000 where the Bureau of the environmental transport and districts published, Building a better life: A strategy for more sustainable construction, DETR, 2000. The ONS (2009) stated that the economic growth was maintained – at a relatively
stable rate - as well as the employment rate for United Kingdom construction companies which reported almost 8.5% of GDP. NAO (2001) stated that there have been many government initiatives geared towards improving the construction industry and making it financially stronger.

Sustainable development is considered as a path for the construction company to move towards accomplishing practical development considering environmental, socio and economic issues. It is additionally an approach to depict the construction company's obligation towards ensuring the environmental sustainability. An expansion in the number of willful policy legislation and regulations, economic measures and financial motivators such as; landfill tax climate change levy, aggregates levy, renewable Grant schemes, land utilizes impetuses and building change controls aided with the bid to provide more sustainable development(Emery et al., 2007). Sustainable development is further backed by the reflection of sustainable construction agenda amendment of the following: the energy, building regulations, planning and the communities’ white paper.

Oluwole, (2011) posits that a large group of demonstration projects on sustainable construction activities provide unmistakable proof of the positive result of sustainable construction. Groups such as; Rethinking Construction, WRAP, and Sustainable Construction Road Show were big proponents of sustainable development in the construction industry. Inquiries about the focus on sustainable construction supported by the government have been attended to across the country through various mediums such
as; conference, books, journals, articles, and universities who are putting forth different courses and degrees in the fields (Adetunji, 2006).

There are joint activities and initiatives geared towards awareness, capacity building, and reporting systems. Initiatives such as Global Reporting Initiatives, CIRIA's industry sustainable indicators, construction task force and building team, etc., all played a role in spreading awareness (Olugbenga, 2005). Sectors of the industry (steel, solid, brick, civil engineering, and so on.) have built up their own particular sustainability technique and activity which has begun writing in progress.

3.2.2 IMPACTS OF THE CONSTRUCTION ACTIVITIES IN THE UK ENVIRONMENT

As said by Smil (2003), the environment fills in as source-based and furthermore executed as a repository for waste and capacity. This depends on waste biodegradability or the biodegradability of the material level goes beyond what is allowed, as said by Pearce, (1998). The environments have a direct value in the process of supplying the necessary materials for economic purposes, as well as intense interest on waste items. Subsequently, these activities increase the value of the normal specific ways of the economy by providing humans with recreational facilities that provide the human mind with the constructive and pleasant environment (Sanrom, 2006).

The principal environmental legislation body in the United Kingdom government has implemented a law that deals with any acts in contravention of the law. Also, the risk of
upshot penalties punishment sanctions on the activities trade or maybe jail is a possibility. The history shows that Harvye and Ashworth,(1999) might be right with the statement made that said the construction industry and its exercises are worried about the regulation design, planning, manufacture, construction and upkeep of the building and others structures. As Olomolaiye (2013) stated, construction activities are known to have major impacts on the environment and are a huge consumer of an extensive and wide variety of synthesized resources. The limited definition looks toward the actual on-site construction activities of contractual workers.

The environment's immediate value is through giving the fundamental materials to economic activities and absorbing the waste item subsequent to its activities. The environment, in addition, increases the value of the normal working of the economy by providing the human with recreational facilities and different wellsprings of delight and incitement, Burgan and Sansom (2006).

Material fabrication and construction represent an expected 122 million tons of waste, or thirty percent of the waste in the UK (Anderson, Edwards, 2000). The UK parliament has implemented criminal and civil laws that can be observed before, during and after the life of a project. Criminal law comprises of laws made by Parliament that is called Acts, Regulations or Statutory Instruments. The principle assortment of environment enactment in the UK is criminal law, and the contravention of these laws can bring about fines, endorsements on a business exchange or even jail. The life circle assessment is a
strategy to measure and evaluate the environmental impacts related to an item system or activity, by describing and surveying the energy and materials utilized and discharged to the environment over the life cycle (RILEM procedures, 2000).

3.2.3 CAUSES OF THE IMPACTS OF CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT IN THE UK

The UK construction industry is special; it is a huge and comprises of various sectors of industry activities. It has actually constructed Great Britain, and its landmarks are around for all to see. Its activities are worried about the regulation, planning, manufacture, design, construction, and maintenance of buildings and different structures (Harvey and Ashworth, 1997; ONS, 2002). Construction activities are known to majorly impact the environment and are a consumer of a wide variety of natural resources and orchestrated resources (Olomolaiye, 2013).

Construction is one of the biggest consumers of energy, material resources, and water, and it is an imposing polluter (Oluwole, 2011). Nam and Tatum (1989) suggest that, historically, construction alludes to all activities related to the erection and repair of repairing structures and facilities. On a similar swing Wells (1985), describes development as an activity including the formation of physical infrastructure, superstructure, and related facilities.
A construction activity has regular environmental impacts related to any designing plan amid the construction stage, landscape impacts, and consequences on the ecosystems, as well as environments, noise, virtual interruption, and topical vexation; for example, noise and temporally pollution discharges because of expanded activity as a result of transportation of labors and of materials, accidental occupation, whether temporal or not (Theodoratos, Karakasidis, 1997).

They are released in the course of the manufacture and transportation of materials in addition to site activities and have had dangerous repercussions to the natural surrounding (Ofori and Chan, 1998). The construction company creates a colossal amount of waste. After much investigation from different researchers, the results demonstrate that a huge volume of waste comes from production, transportation, and utilization of materials (Kein et al., 1999; Osmani et al., 2008).

Aside from waste generation, the building industry is a rapidly growing world utilizing energy and fossil fuel product resources, which has effectively raised worries over supply difficulty, depletion of energy resources and substantial environmental impacts: ozone layer depletion, carbon dioxide releases, a worldwide temperature alteration and climate change. Ofori and Chan (1998) watch that on average we spend about 90% of our lives in buildings that might condition the building we live, work and play in. These have turned out to be a major supporter of our comfort life (Oluwole, 2009).
The narrow definition focuses consideration around the actual on-site construction development activities of contractual workers while the wide definition, which really covers the actual degree of the construction industry, draws the quarrying of construction raw materials, fabrication of building materials, the offer of construction items, and the administrations given by the different related professionals (Pearce, 2003).

3.2.4 CONSTRAINTS FACED IN MITIGATING CONSTRUCTION ACTIVITIES IMPACT ON THE UK ENVIRONMENT

Concerns are gradually growing amongst a variety of communities for the deadly consequences that it brings along, while the construction industry has a different view of it. Admittedly the construction division is apparently a standout amongst the most resource-intensive industries. Actions have been taken in the environment management as well as construction exercises in order to make them more sustainable (Maher, 2005). A long design plan to bring down such issues is upheld, requiring the support of the United Kingdom Government, the industry, and the overall population. The high ranking of outline issues recommends that the connection amongst contractors and architects remains fairly in nature and, that present dependence on "conservative" procurement is supplanted by more current alternatives, such as partnering and corporate blueprint alliances (USGB council, 1996).
First of all, the thought in impacts assessment should be the citing of construction works. Secondly, the development ought to maintain a strategic distance which harms the ecological site and high-quality landscapes, and thirdly, it is the environment agency policy that looks for the particular regions of development in ranges which are not helpless against groundwater contamination (environment agency, 1998e). That’s why it was emphatically recommended in this way that developers undertake an assessment option on site.

3.2.5 MEASURES TAKEN TO REGULATE ENVIRONMENTAL IMPACTS DUE TO CONSTRUCTION IN THE UK

The checking exercise and the identification of potential impacts, asset measures ought to be proposed to maintain a strategic distance or decrease potential negative impacts to air, water, ground, ecology, and humans, or to offer and boost positive perspectives with the advancement direction has given by the environmental organization to help designers on a scope of applicable subjects as contamination in anticipation of guideline (scoping handbook).

On one side the UK development industry consumes about 420 million tons of materials yearly; the most elevated of any division (DTI, 2006; Plank, 2008), and on the other side it is one of the biggest exploiters of renewable and nonrenewable natural resources (Spence and Mulligan, 1995; Uher, 1999). The United Kingdom government’s
responsibility regarding sustainable construction is set out in 'Building a better quality of life: a technique for more sustainable construction' (DETR, 2000). They have come up with the accompanying rules:

The undertaking of assessments prior to the commencement of proposed activities assists in the integration of information relating to social, economic, biophysical and technical aspects of the decision-making process. Timeouts association of key stakeholders in the basic leadership process, WCED (1987); the promotion of the interdisciplinary and multi-stakeholder relations (between people in public and private sectors, contractor’s workers, consultants, nongovernmental) ought to happen in a participatory, intelligent and consensual way;

The acknowledgment of the complexity of sustainable concept goal is to ensure that alternative approaches are compared. This is so that the project destinations and the stakeholders are happy with the last activity implemented; the utilization of an existing cycle structure perceives the need to consider every one of the standards of reasonable development at each phase of a project's improvement (i.e. from the drafting to the decommissioning of projects). The utilization of a framework's approach recognizes the interconnections between the economic aspects and environment. A framework's approach is likewise alluded to as an incorporated (outline) approach anchored in compliance with enactment legislation and directions.
The foundation of a willful commitment regarding consistent change of (sustainable) execution, bring in its wake the administration of activities through the setting of targets, monitoring, assessment, criticism, and self-control of progress. This interactive procedure can be utilized to enhance implementation with a specific end goal to support a persistent learning process; the distinguishing synergies of collaborations between the environment and development.

3.2.6 LESSONS LEARNT

In the UK research of construction and its activities shed some light on the lessons that have been learned. Of importance was the discovery that construction activities influence environment for the duration of the life cycle of a construction project. Unmistakably, the life-cycle idea alludes to all exercises from the extraction of resources through item manufacture and utilization of the last disposal or reuse. Another lesson learned was the comprehension that there exists a connection between construction companies and the environment and the impact thereof.

However, construction activities regularly impact the ecosystem related to any designing plan amid the construction stage, landscape impacts, and consequences on the effects on the local ecosystems and natural surroundings. Other causes that impact the environment are; noise, virtual interruption, and topical vexation, for example, noise and temporary contamination outflows because of expanded movement on account of
transportation of laborers and materials, occupational accidents and temporal blindness (Theodoratos, Karakasidis, 1997).

Therefore, on the off-chance that we acknowledge this, the connection between sustainable development and construction turns out to be clear; construction is of high economy significance yet has solid environmental and social impacts as referred to Bartlett, (2001).
3.3 SOUTH AFRICA

3.3.1 BACKGROUND OF THE CONSTRUCTION INDUSTRY IN SOUTH AFRICA

The South Africa construction industry is a huge supporter of development and employment. However, the business has been in on a downscale since the 2010 soccer world cup (Rotimi, 2015). Furthermore, during the course of the most recent 20 years, South Africa's construction sector has undergone a remarkable change since the time of politically-sanctioned racial segregation when it was obliged by authorizations and racial strategies, controlling its growth (Ngonyama, 2010).

However, the post-politically-sanctioned racial segregation state driven by the African National Congress effectively interceded for the benefit of capital through a progression of arrangement measures to promote stability, cultivate financial development and make empowering conditions for the universal aggressiveness of South African construction firms.

The principal part of this strategy procedure was the foundation of a Construction Industry Development Board, the foundation of a Register of Contractors, the booking of open segment spending through the Medium Term Consumption Framework process and bolster projects to build up the rising black sector which successfully fused black capital into the capital collection previously denied under politically-sanctioned racial segregation. The practically prompt move from the Reconstruction and Development
Program (RDP) in 1994 to a progression of neo-liberal large-scale economic approaches from 1996 onward guaranteed expanding levels of labor adaptability and enhanced efficiency of the labor force - state intercession was in this way vital in guaranteeing that the construction sector delighted in 18 years of managed economic development with a pass mark GDP commitment of 2.3% over a 20 year time frame (Ngonyama, 2010).

In the vicinity of 1994 and 1998, public spending was directed to the prompt needs recognized under the RDP. The post-apartheid-sanctioned racial segregation period was set apart by investing interest in social and house infrastructure. With the passing of a progression of neo-liberal economy approaches the administration moved concentration towards economic infrastructure from the mid-2000s.

Many challenges have been identified as the factors going up against and affecting the execution, advancement, and development of the construction industry of SA (windapo, 2013). The industry has demonstrated a remarked resilience in terms of challenges encountered with respect to the general positioning, the increments in the expenses of building materials, access to moderate home loan/credit and high-interest fluxion as the main construction and improvement challenges influencing the performance in South Africa.
3.3.2 IMPACTS OF CONSTRUCTION ACTIVITIES IN SOUTH AFRICAN ENVIRONMENT

The low edge environment has put additional weight on vital choices identifying with limit, tender movement and estimating. It likewise highlights the significance of magnificent project execution and close-out, outside trade developments directly affect the international business of South African construction organizations. For the most part, Africa construction organizations work in various remote areas where their construction tasks are liable to the danger of nearby social distress, which can prompt venture delays, bring down generation and harm to hardware.

Construction organizations need to put resources into their own particular and imminent representatives, up-skilling subcontractor likewise makes extra strengthening openings. Regulating contamination is not as viable as applying contamination innovation (South Africa Department of Transport, 1994).

CIBD (2004) demonstrates unmistakably that failure rate of South Africa’s construction industry is unacceptably high In the report it has been demonstrated that there were 532 liquidations of development companies in 2004, 371 in 2002, 554 in 2001 and in general 1400 companies that couldn't stay viable in the 2002-2004 period. The same report says that there has been a long-term decline in productivity in the industry, in the investigation of the CIBD enlisted building and civil engineer contractors. Its findings were a decrease
of 801 which can be represented as 8% in the number of contractors enrolled in 2010 in contrast with 2009.

Construction was especially hard hit when the infrastructure improvement highs leading up the way to 2010 FIFA World Cup were trailed by a worldwide recession and/or depressed growth. Insights itemizing the decay of the industry in the course of the most recent three years have been all around plugged (South Africa construction first version, 2013). The fundamental concentration of change endeavors are the building appraisal and rating frameworks of the green building development which have yielded extensive achievement. Vitality and water utilization have been decreased extensively.

In the building environment creation and utilization, the construction has been consuming over the top amounts of resources of the raw material, extra issues of grave concern are the impacts of industrial waste on the aspect of the environment which society wishes to secure and conserve, Ramukhwatho at al., (2014). Covering budget plan vigorously will be the test for the following couple of years, in spite of the fact that the acknowledgment of the requirement for this foundation improvement is clear. The granting of tenders has been slower than at first. The private sector is frequently driven by the mining industry, which has been a huge supporter of aggregate construction use (South Africa construction first release, 2013).
3.3.3 CAUSES OF ENVIRONMENTAL IMPACTS OF THE CONSTRUCTION ACTIVITIES IN SOUTH AFRICA

A majority of difficulties are not construction issues but rather should be tended to and overseen by the construction administrator to guarantee to extend achievement. A portion of the construction issues incorporates workforce considerations; security, time constraints, and the changing nature of the occupations (Weave, 2005).

These environmental effects are brought about essentially by insufficient arranging and not clinging to the environmental administration, deficient arranging and getting ready for the construction site, uncontrolled extension of the development site impression, and uncontrolled action of construction staff.

Other factors are; injudicious evacuation/disturbance of vegetation, and unnecessary loss of soil, uncontrolled vehicular movement and vegetation, erratic capacity of vehicles, gear and materials, uncontrolled overhauling repair and refuelling of vehicles, indistinct arrangement on strong waste administration, misty approach on wastewater, formally dressed utilize, capacity and transfer of risky materials, erosive energy of tempest water and spillovers, inadvertent fires, absence of follow up activity after the consummation of development works.
3.3.4 CONSTRAINTS FACED IN MITIGATING CONSTRUCTION ACTIVITIES IMPACTS IN SA ENVIRONMENT

It might present a result of strong studies undertaken by writers and researchers which challenged assumption to influence the performance, development, and growth of the South African construction industry. To achieve the goals of various challenges that might have been reported by the result of the survey of the perception of the construction industry, stakeholders are then presented (Windapo, 2013). The implication of the findings for the industry development and growth of the South Africa construction industry are discussed.

In the public sector capacity Mbande (2010) has observed that there is a shortage of skills within the South African skills sector and in state-owned enterprises, as presented by the (CIBD, 2004), public sector capacity is a key constraint on infrastructure delivery and sustainable growth in the South African construction industry. In theory mismatch is between available skills and required skills as suggested by Mbande (2010), therefore there is a correlation between an increase in community protests due to the lack of service delivery in South Africa and the acute shortage of skills in the construction sector, emphasized also by the (CIBD, 2004), which clearly reported that the skills supplied to the market through the further education and training (FET), system was in many cases not appropriate to the needs of the construction industry.
This resulted in a skills gap and a decline in the capacity of the professional sector within the construction industry, the critical global issues, the current global economic recession and its effect on the world economy pose a challenge to the performance of the construction industry in South Africa.

The CIBD (2004) has reported that the existing preferential procurement environment is a challenge as it encourages historically disadvantaged professionals to establish their own firms rather than join established companies. This brought about the opportunity for consolidation of specialized expertise and diverse projects within medium and large companies.

Furthermore, poverty alleviation has been identified as one of the Millennium Development Goals (MDG) precisely because poverty has the ability to destabilize the world economy and lead to global unrest (Van Wyk, 2004). It has been demonstrated by the CIDB that construction companies are encouraged by government policy to employ more labor to boost the economy and alleviate poverty (CIBD, 2007).

As stated by Ofori (1990), perhaps the most important physical constraint on construction activity might be land because the supply of land is largely fixed. Boshoff (2010) added an idea in saying that while there is an extensive supply of public land; private land is not readily available in South Africa. It was shown by Van Wyk (2004) that the performance of the construction industry has a high rate of an enterprise failure. It
reflects demand volatility, high levels of non-completion, poor management and productivity and the significant growth in the construction industry is dependent upon price stability in material cost.

Climate change poses a huge challenge to current global industrial development addressing global issues such as sustainability, global warming (levels of CO$_2$ emission by buildings under construction and in use), and the use of water and other natural resources. It involves a requirement that might be difficult for construction sector participants to comply with (Van Wyk, 2004).

3.3.5 MEASURES TAKEN TO REGULATE ENVIRONMENTAL IMPACTS IN SA ENVIRONMENT

Construction is one of the largest users of energy, raw materials, and water. However, energy efficiency and water conservation are prioritized on the green agenda while the key environmental impacts associated with material consumption, namely; depletion of resources, and release of solid and liquid wastes and toxic emissions to air – these are barely addressed. Environmental Impact Assessment (EIA) has been successfully adopted in South Africa in line with international trends. A number of international scholars found that EIA offers distinct advantages to a proposed project (Bartik, 1988; Porter & van der Linde, 1995; Annandale & Taplin, 2003). However, there are negative perceptions about EIA and its influence on development.
The main statutory provision relating to the environment is the section 24 of the Constitution of the Republic of South Africa Act (No106 of 1996) (environmental right), which is stated as the right to an environment that is not harmful to health or wellbeing. In fact, the realization of this with a good result the constitution is providing, it might have to take in consideration reasonable legislation in other measures to the (section 24(b), constitution).

Legislation South Africa (1989) and Environment conservation act 73 of 1989.pretoria: government printer contains the requirements for environmental authorization through environmental assessment and control activities detrimentally affecting the environment. The Act contains noise regulations in Section 25. There are also several Schedules related to noise. Schedule 4 prohibits “disturbing noise” from any manmade source. A disturbing noise is defined as a noise level which exceeds the ambient by 7 dBA or more, measured over a period of at least ten minutes. The Act also contains waste management regulations in Section 20.

The construction and operation of the proposed infrastructure may disturb the environment and generate noise. South Africa (1996) Constitution of the Republic of South Africa acts 108 of 1996. Pretoria: government printer. Section 24a sets out the right to an environment that is not harmful to health and well-being. Section 24 b provides the foundation for the protection of the natural environment while promoting development; the proposed project will assist with the reduction of reliance on fossil fuels.
The proposed project will promote development in the country, and measures will be put in place to protect the natural environment, South Africa (1998). National Environment Management Act 107 of 1998; Environmental authorizations must be granted prior to undertaking any activity that could have a detrimental effect on the environment construction of the waste site.

3.3.6 LESSONS LEARNT

The lessons learned from the literature showed that there is a coherent understanding of environmental impacts assessment adoption and implementation. However, on the range of the dominant factors numbered, there is quite a few of them that stood out. These are The Data accuracy,-timeliness,-Support of top management,-project manager and change management,-the Training of the prospective end-user. They have a relation of success between the environment and the impact assessment.

Furthermore, Renaud and Van (2008), in accordance with Venkatesh et al (2003). Indicated that acceptance might be viewed towards an attitude in front of a new technology which might be influenced by some factors: the expectancy of the performance to determine the willingness to apply system as well as the perceived belief that applying the system is going to look at the job performance;

Effort expected is the intention of the uses of the system and the convenience of implementing the system easily, and technical infrastructure facility for the supporting of
it as an existing structure (Venkatesh et al., 2003). Clients ought to be made informed of their ability to influence the H&S amid the project design and concept, enhancing of the prospection the improved allocation of resources and necessity to H&S that might remove or significantly mitigate hazards linking with construction and accidents.

3.4 CONCLUSION

Undoubtedly, the construction sector is one of the strong and complex industrial developments worldwide. Sustainability in construction as an aspect of sustainable development is not yet acknowledged in the developing countries and on the entire continent as stated by, Henry et al. (2009). On one hand, the problem that is relevant and urgent is that the construction industry activities can negatively impact the environment. In practice, this is a big detractor from the focus of sustainable development and on the other, almost all construction developments are designed, conceived, permitted, constructed, operated and managed without a logical account of their impacts for sustainability. In fact, most of the construction developments in the latest decades were moving towards the direction of cost reduction, energy intensive and reduction in manpower. And some other processes which direct economy

In the past decades, our planet has been physically limited; as a supplier of resources as well as for waste disposal. Ecosystem processes have been theoretical well implemented, as well as research or ideas like ecosystem biodiversity says Hawken
(1994), carrying capacity Daly and Cobb (1989), the limit to growth Meadows et al. (1992), as well as natural capacity (Lorins et al., 1999). They were not activities that have been put in place into the state of degradation that looks at the ecosystem services the statements made in accordance with, Dyllick and Hocket (2002). It has been studied that construction has retracted influence during the extraction of raw materials. This could be actively discouraged by asking less-renewable raw materials, more recyclable and efficient use of energy as well as mineral resources, Addis and Talbot (2001).

Furthermore, it has been shown that construction item factors usually change. Examples of some of these are; designing, fraudulent practices and kickbacks, extra works, management of contracts, availability of necessary labor, contract procedure and period of duration of contracts, Ameh et al (2010). It might be differentiated that construction sustainability has three aspects of sustainable: environmental, social and economic. It is imperative to make a connection with this principle and understand the components such as management of resources, the design of life-cycle, human habitat design), as stated by Sev (2009). The African countries have to learn what was put in place as systems and conform to the EIA techniques in fulfillment of their own needs (Wood, 2003; Kakonge, 1998). Therefore, the impacts analysis of the construction activities on the environment might have a clear view of a “cradle to grave” stated by Ofori et al (2000).
However, to bring a better environmental observation in Africa, the EIA has to be more detailed in measuring construction capacity and decentralization and participants should be involved, reasonable suggestions to improve regulations which are in place and training ought to be set up.
4 CHAPTER FOUR: ENVIRONMENTAL IMPACTS OF THE CONSTRUCTION ACTIVITIES IN REPUBLIC DEMOCRATIC OF CONGO (D.R.CONGO)

4.1 INTRODUCTION

The present population of D.R Congo is 81,700,752 as of Tuesday, April 18, 2017. In light of the most recent United Nations assessment, initially the populace is identical to 1.09% of the world total populace; this places it at position number 16 in the rundown of nations (and in-dependencies) by population. The density is 36 for every Km\(^2\). (94 people for every miles\(^2\)). The land is 2,264,847 Km\(^2\) (874,462 sq. miles). 39.8% of the populace is urban (32,712,918 individuals in 2017) and the middle age in D.R Congo is 17 years.

The construction industry may be listed among the first or sensitive sectors especially when we look at the roles it plays in the continuous growth of developed and developing countries (Ofori, 2000). Undoubtedly, the role of the sector has to be taken with deep importance because of its output and due to the achievement of socio-economic objectives such as shelter, infrastructure and employment opportunities (Usman et al., 2012). Yet the small and medium construction company, no matter the contribution, has been contributing to the economic growth through its creation of job opportunities, wealth, and innovation in providing strategies that are competitive as well as the setting apart of other organizations. Furthermore, this opportunity offers the construction company the ability for better service delivery so as to respond to the demand of clients by putting in place innovative approaches.
Many subjects which have implications for the construction industries that have been discussed in the few past years have been focusing on what is made in the industrialized countries in relation to non-industrialized countries.

The estimated service might also point to the force applied and the connection between the two contracts, thereby establishing the way of life of Congolese people on another. On a similar view, Abrahamsen (2000); expressed that taking force through military upset governments had and still has a hostile voting public to pacify outside contributors and leasers so as to get improvement help, on the one side and their poor majority whom they have to get re-settled, on the other.

Construction projects might have changes which may happen from separate origin, by a quiet variety reasons, at any step of the a project and might have significant impacts, its deals with time which could transform the foresee or emergent, proactive or active, or pre-immovable or post-immovable, its aspect on need change could be optional or in demand, preferential or regulatory. Its aspects on the impact, innovation could be attractive, indifferent or disruptive, the construction projects management is related to all the inner and outside factors which influence project changes, the professional bodies in the Republic seeks to provide likely improvement through the entire project (brute land report, 1987). The republic has to deal with inconsistent management of the improvement procedure might land in many disruptive impacts. Some of them are easy to measure
while other are more complex to numbered, these study present in the chapter integer a developed system which might improves the change management.

4.2 NEGATIVE IMPACT OF CONSTRUCTION ACTIVITIES ON THE DR CONGO ENVIRONMENT (SUPPORT WITH ARGUMENT)

The environment is debilitated gravely by such a variety of issues, some of which are brought on by the exercises of construction projects. The worldwide worry to address environment disintegration made by various formative activities might be the basis to awaken researchers to assess environmental impacts of the construction activities of the project, Rutherford (1994). Most of the work that was done in the university is about solving what exit and not in preventing in what is yet to come. However, the impacts that are going to be listed are proposed that they essentially have an effect on the environment; creating environmental corruption, majors’ ecological effects of building development activities to incorporate environmental contamination, resource exhaustion and environment obliteration bringing about the annihilation of a biological system. Others include; desertification, and soil disintegration and increasing material wastage (Hanley et al., 1997).

Waste Management, Pollution Control, and Ecology Conservation were positioned as the most imperative ecological insurance measures utilized as a part of controlling building development environment effects (Kraft, 2012).unfinished houses and
eutrophication around the area where the construction are conducted most of the time people complain about the noise and the dust polluting the environmental life hood. On one hand, the achieving of the desired result that might protect the environment has to involve an analysis of a durable development, it might be costly but that the way out of this repeated issue vastly controlled. Dietz (2001) opines the life expectancy might be reduced if we look little on the environmental issuer as well as the use of resources, as well the life cycle of material and products in the Republic. This study brings a contribution and inclination to evaluate the essential effects of building environment tasks to effectively energize sustainability in the Republic.

The environmental effect may be numbered into visual effect, material effect and resources utilized, energy action, space condition and lighting effect, land utilized and ecological effect (Duinker. 1983). So, any building structure over the earth surface exhibits a visual effect on the earth. The public in general judgment on the presence of structures may, however, be relative and subjective with regards to the seriousness of the effect (Angel. 1987). This is maybe the reason that as of recently; it has been hard to manage and control the building sprawls in the D.R.Congo. Thus, the significance of the built environment in its current condition merits considering in the urban view.

The environmental impact might be evaluated against the risk to the population and ecological improvement, without disruptions to the course of the life (nature) cycle, Dietz et al. (2001). The fright includes the gravity and the permutation to the estimation of life
that are controlled by physical, chemical, organic and psycho-social components, which thus indicates how far the harm has been done in the D.R.Congo.

4.3 MEASUREMENT OF CONSTRUCTION RELATED ISSUES

Considering the span of the construction industry requests and commitments, and in many developing nations, the resource requirements, the arrangement of an organization does not ensure the accomplishment of construction industry advancement and also for the D.R.Congo. An essential point worth focusing on is that development industry improvement is a persistent procedure. Many advances in the improvement of developing nations have as of late actualized long-term anticipated developments enhancing their construction (Latham, 1994; Egan, 1998). The vast majority of the surveys have been given energy by both global and outer patterns which show future aggressiveness for each of these development enterprises. The D.R.Congo patterns incorporate the requirements of an undeniably complex economy, customer requests, mechanical and social change, and globalization prompting focused weights.

4.4 MEASUREMENT OF DESIGN-RELATED FACTORS THAT AFFECT PROJECT SUCCESS

The controlling advisory group speaks to the important tranche of the industry, with the accompanying terms of reference to touch base on a vision and role for the development in the 21st century; furthermore to look at the present status of the construction industry
as to systems, labor, administration practices and others and benchmark it against the best norms on the planet; to set solid focus for the construction industry and its workforce in Singapore by considering the crevices between current reality and the proposed vision; and to prescribe techniques to meet the objectives and move the construction industry and workforce towards the planned vision (construction 21 steering committee, 1999).

✓ The mentioned factors that should be taken into cognizance in order to elevate the industry further are as follows:

✓ Enhancing the competence level of the industry,

✓ Raising the level of skills,

✓ Improving industry of techniques and practices

✓ To integrate an adoptive construction approach

✓ External wings to be developed,

✓ Common defense effort for the construction industry (construction 21 steering committee, 1999),

Undoubtedly, the globalization of industries has opened a myriad of opportunities on a global scale that companies that can advantage of. Some of these are:

✓ Involvement of the international finance

✓ Local construction firms and sponsorship of the privatized project
Direct foreign investments and increase of construction demand

The ability to control and follow up the cultural issues is an outcome of projects and corporation success and also it might study concerns related to the construction culture in place: the impact of the D.R.Congo enlightenment on construction activities, construction projects, construction sites and construction firms. Furthermore, focusing on the environmental impacts and considerations of the construction activities, as well as the usage of resources, the execution process, as well as purpose of usage. (Rwelamila et al, 2000).

Adapted from Ofori (1999), this following couple of factors which are: Nature of territory and ground conditions; Different resources in operation of building, Techniques for construction on site, Arranging and outline of facilities (capability of day-lighting and characteristic ventilation), Closeness to water sources and biological communities, Development extend administration frameworks (quality administration systems), Lifecycle economy, Site control measures (housekeeping),

And as well as the Extent of utilization of energy, Sustainable crude materials are recovered, Neighbors and overall population, Ease of destruction of the building (deconstruction) and How materials are transported to site and put in stock are among the executions process in development.
It might be possible for the foreign firms who will be unable to make ends of the opportunity to extend technologies to developing countries (Hillebrandt, 1999). Furthermore, that might make the outside development firms to repay lip benefit for the innovation exchange (Carillo, 1994) or surveying the significance to maintain a strategic distance from it. In addition, nearby organizations won't be in a position to profit by innovation exchange or to consequently use the procured aptitude.

4.5 BARRIES FACED BY THE CONSTRUCTION COMPANIES IN ACHIEVING SUCCESSFUL PROJECT OUTCOMES

The economies of almost all developing countries are currently confronted by severe difficulties owing to the mixture of lower commodity prices, higher energy costs on the market, falling exchange rates and a rising inflation rate Tilton (2006), especially in the D.R.Congo. At the same time, the D.R.Congo faces immense social problems (including a rising urban population and unemployment) which are putting pressure on the country’s resources and capabilities. It might be a fact that the construction industry in a typical country such as D.R.Congo is facing reduced levels of demand as a result of adjustment programs which invariably involves cuts in government capital investment it can be subtend by the view of Ofori (2000).

As Ofori (1993) suggested, the severity of constraints in the operating environment makes the construction industry not to perform at optimum level. Moreover, the
participation of making easier the social problems has to be done by the construction industry and also helping national economies to recover as well, the statement is available for the Republic Democratic of Congo.

Researchers should be hard-pressed to find solutions to pressing issues in the industry and therefore find ways to be one step forward and contribute towards solutions that will elevate the issues faced (Bitner. 2010). On one hand, the construction industry has to assume its role effectively in the economy by realizing potential jobs and maximizing the opportunity to create jobs for others. They must also, ensure that business activities are stimulated in each and every single part of the economic sector.

To that end, the adopting of new strategies would be a requirement in order to achieve it. On the other hand, infrastructure for proper development must be put into effect in order to bring awareness to the public (Chen. 2008). More studies should be made in order to find proper strategies which are suitable for the D.R.Congo.

In order to achieve logical results in terms of improvements in the performance of, and prospects for, the construction industry, several issues require observation. Firstly, the development of the industry might formulate long-term plans so agencies have the task to work on it (Ofori, 1993). It has to be supported by clear reviews of the state of the construction industry, its concerns and imperatives. Secondly, the task outline has to allocate resources and be effectively utilized. The priority in those resources is people...
and in particular, the personnel of the agency especially on its leadership (Miles and Neale, 1991).

Thirdly, the industry should be in close contact with the agency, so the agency might have complete control over all its aspects. Fourthly, as mentioned above, the construction industry might, preferably, have a role to play in the work of the agency in formulating and implementing its plans. Finally, the relevance of the agency should be continued up to date. This implies that its plans, policies, initiatives, procedures and communication channels should be continually reviewed in the country and fine-tuned or radically restructured where necessary.

Universities and corporate developments are of crucial importance at this right level of the study. The construction industries need institutions and companies which are going to take a long-term observation and review and are prepared to invest in human resources, equipment, research and in development in order to improve the capacity and performance. However, it has been known that in the developing countries there is a lack of knowledge, short-term orientation and a lack of focus on the construction (Ofori, 1991). Qualify personnel is rare and expensive and/or unwilling to appoint them to suitable positions and assume responsibilities that will enhance the end goal in mind. Many institutions need to have a serious focus on the management development which is a key concern of construction firms in developing countries.
4.6 MEASURES TO REGULATE BUILDING CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

The topic of environmental issues has been debated since the eighties and researchers and institutions have been a major problem that kept international attention since the mid-eighties. Countries do believe that or might be only paying attention to the environment and endeavor to protect it when getting on a high level of socio-economic development. However, since developing countries face severe environmental related problems, the issue of preserving the environment might be in the highest interest (UNCHS, 1996). Most of these countries have sensitive environments and also have been challenged with high levels of land degradation (erosion, aridity, desertification, drought, flooding, alkalization and salinization).

The problems in the environment of the developing countries exist side-by-side with a lack of management experience, financial resources, legal and administrative systems necessary to control the problems through public and formal education, formulation and enforcement of command and control and the weighting of legislation and regulations as well as the devising and implementation of economic instruments which is: incentives, grants, subsidies and taxes.

Firstly the most relevant of the adverse impacts to the majority of people in developing countries is the ways of resources utilization, since most of their people rely on natural
resources at the basic level such as the forests for their livelihood, secondly the health problems importance relating to air and water pollution, considering the rudimentary nature of the health care system and finally to consider loss of land when construction is taking place on the green-field sites, for the others uses the construction take land away from different ends.

Ofori (1993) suggested that there might be specific researchers who should seek to recognize the actual realities in developing countries to adapt and use the available analytical techniques to help the regulations of difficulties facing their construction industries by taking cognizance of the following: government action, legislation and regulations on environmental performance, requirement for licenses and approvals, subsidies, tax incentives and grants, certification and labeling of products, market forces, clients, insistence on better environmental performance, other construction firms adopting or benefiting from, good environmental practices, institutional initiatives, professional bodies offering advice and support services to members, operational environment, action of pressure groups and informed users (Ofori, George.,2000).

Furthermore, to implement a conceptualization of the Congolese construction firms and development of a common framework for its analysis in government level and development of conceptual models of stages through which a construction industry passes as it progresses to maturity; how Congolese construction might help nations out of long-term economic problems and how this industry should be improved in such
circumstances; appropriate construction materials and techniques; design of educational programs for producing essential technical personnel. It should also be suggested that such research works be coordinated so that they might result in better dissemination.

4.7 CONCLUSION

Globalization is a one-way flow of technologies export from developed countries to developing countries. After observation, firstly the market of developing countries’ firms still active in each other. Secondly, it has to be remembered that, most of the developing countries are those which export in large amounts. Studies shows that 30 international firms revealed that 58 contractors where listed at least once among the top 30 Engineering News Record (ENR), the highest number was found in the US with (14, or 24%) followed by Japan (9, or 16%), France (8, or 14%), UK (6, or 10%) and Germany (5, or 9).

Developing countries and the industries suffer for the international large project which is large, complex and might only be undertaken by a foreign contractor, it should be advised to developing nations to use construction work to support the developing of their local contractors so that they might replace the foreign firms. Indeed to propose to close that gaps in the long terms between local construction firms and their foreign counterparts in the technology, finance and management knowhow should be supplied through technology transfer: via joint ventures among the two groups of firms or company. Foreign
companies are not willing to effectively transfer technology since they believe that it means they would be giving treatments to the future competitors. Conduct to illustrate that the local and the foreign company have benefited if systematic efforts are made by the latter to develop the former.

The country has to implement the basics of them in the same way of the following steps: firstly Clients resist addressing health and safety in the earlier phases of a project. Secondly, Clients do not afford health and safety the same status as other project parameters. Thirdly Increased client involvement in all the project phases with emphases on the earlier phases would result in a reduction in incidents and accidents on sites, fourthly legislative background fifthly baseline analysis sixthly prediction and evaluation of impacts finally mitigation measures.

The government has to focus a lot of energy in researchers on the campus and institution that looks after environmental and construction issues and also furthers observation has to be made like the making decisions, to proposes a design plans, the project implementation and monitoring, the finding of no significant impacts, the prepare of an EIA, the public notice of intent to prepare an EIS, the draft of an EIS, the agency review, the agencies decision whether action should be permitted, the action to refused actions permitted, the possible conditions of CEQ arbitration, the record of decision and Judicial resolution possible, working Papers have to be taken into consideration with a follow-up in the D.R.Congo firms.
5 CHAPTER FIVE: METHODOLOGY AND DATA COLLECTION

5.1 INTRODUCTION

The chapter explains the method that was used in the carrying out of the research. This chapter gives the physical area where the research was conducted, as well as details on the population sample. The methods employed for the collecting of data and instruments which were implemented to ensure the reliability of the results are also explained in detail.

Use was made of questionnaires to collect data from quantity surveyors, architects, construction professionals, civil engineers, project managers, and construction personnel. The questionnaire was designed to focus on the negative environmental impacts to be measured and assessed which will lead to the implementation of sustainable decision making or guidelines.

5.2 RATIONALE OF THE STUDY

The negative impacts on the environment due to construction process remain a challenge which has not really been considered sensitively. Some authors have shown that the negative impacts have impacted the construction project process. Factors such as negative impacts have a serious and various effect on the outcome of a project.
Furthermore, problems such as the late completion of the project, loss of productivity, cost increase and termination of the contract are frequent. Many researchers have expressed their point of view about the abovementioned issues and provided/suggested some environmental impact assessment requirements which have to be followed. Therefore this current study is going to benefit the industry by providing a blueprint for construction in terms of adopting the EIA concept.

5.3 RESEARCH APPROACH AND DESIGN

The broad survey of this study opens up a generalization results of a population and after looking at qualitative open-ended interview to quantify the survey from respondents

The combined methods approach is, therefore, a pragmatic view of the world. The quantitative and qualitative data progressions in the realization the study is going to focus on the enquiry of assumption that diverse data type is going to be collected but the well filed and more complete, understanding the problem of the research on one side quantitative approach post positive worldviews experience on designing, pre-test as well as post-test weight of attitudes in the sited scenario, refuting of hypothec data made has a narrow details on theory test of the research (Mouton, 1983) as cited by Barnard et al., 2014; anonymous. n.d), a well-designed questionnaire is used where the mitigation of behaviors is made in the before and after the designed treatment.
Data are collected with an instrument which weight behaviors and the information analyzed by using statistical line to follow and also a hypothesis testing but on the other side qualitative approach constructivist’s worldview, ethnographic design and a follow up of the comportment in real time, the research is looking at the sense of occurrence from the understanding of respondents. The identification of culture-sharing set at the same time there is a shared pattern of acting over time. The principal elements for the receiving of data in the case are observations of the way they comport themselves while the commitment to activities. Also the approach of qualitative transformative worldview, disserted organization and open-ended exchanges for this research, the asking is focused on examining negatives impacts of the construction activities on the environment, each respondent it’s questioned at some length present how they experience was in the facing of oppression on the site management (Frankfort and Nachmias, 1999).

Hence, the research takes qualitative and quantitative approach combine that means we looking at the experiences of the respondents and as well as at the perception regarding the E.I.A process in the construction industry, in doing a described surveying on the same wave to give details on the patterns under directed research Hittleman and Simon (1997),

Quantitative analysis and questionnaires are also critical factors and needs for the achievement of successful implementation of the environmental impacts assessment in the construction firm, a preliminary oriented research with an observation and
experimentations to gather data that is revised and design in numbers, that might give an
easy characterization of data by statistical analysis, and whether the usage of the system
E.I.A might be performed for the improvement of projects, it going to be understood that
the preliminary collecting data was selected in accordance with the reason agreed with
Kealey and Protheroe (1992) and Vos et al.(2004), firstly to present a well-designed
characteristic properly detailed, secondly to interact with a huge amount of respondents
in the domain in a favorable period of time, thirdly to mitigate or reduce subjectivity
opinions and utilization of standard model references in the same waves established
procedure that might be duplicated.

5.4 RESEARCH AREA

This study was carried out in the Republic Democratic of CONGO. The province of
Kinshasa, being the capital, was selected and focused on construction and engineering
firms. Undoubtedly, most of the main branches of construction are settled in the capital
of the country which is Kinshasa. The research leads us to a study that brings together a
huge number of construction professionals and invaluable construction stakeholders in
the private and public sectors combined. The area of the study was chosen because of
the current ongoing projects as well.
Maps 5.1: Map of the Republic Democratic of Congo, Kinshasa.

5.5 TARGETED POPULATION

All things in any field of request constitute a "universe" or "populace" as stated by Kothari (2004). For motivations behind inspecting, a populace does not allude to the number of inhabitants in a nation, but rather to objects, subjects, wonders, cases, and
occasions which the scientist wishes to investigate - keeping in mind the end goal to build up new learning (Brynard et al., 2014).

A populace alludes to a gathering in the universe which has particular qualities – the universe being all subjects who have the characteristic in which the specialist is intrigued e.g. the aggregate number of a number of occupants in the nation who have a post-graduate capability. The survey is geared towards the description of a cluster or individuals who are in favorable position to respond to the questions and to whom findings of the survey apply (Burns and Grove, 1993).

The targeted cluster in this research field were architects, quantity surveyors, civil engineers, constructor managers, construction project managers, project managers, and other construction professionals bodies, who are involved in the field of construction in Republic Democratic of Congo, Kinshasa.

This standard was taken into consideration for the survey conducted in order to have a real image of the negative impacts of the construction activities on the environment, through an assessment might be made and updated.

5.6 SAMPLE

There are two methods for measurable examining procedure in the sociologies: probability sampling and purposive sampling (Teddlie and Yu, 2007). Probability sampling
strategies are by and large utilized as a part of the quantitative research. The stratified random sampling was embraced in light of the fact that it gave every one of the members an equivalent opportunity to be chosen and every one of the members were chosen with similar criteria; the members must be a development proficient rehearsing in the province, D.R.Congo.

This technique is generally embraced when the objective populace shows a similar execution or capabilities, or the testing size is extensive to speak to the whole populace productively and every individual from the whole populace has an equivalent possibility of being chosen as an inspecting respondent.

5.7 DATA COLLECTION

A rundown of potential respondents was created after the survey was affirmed for information gathering by the primary director of the present investigation. The polls were circulated to the respondents in two ways: hand conveyance and through emails. In the wake of finishing filling in the surveys, the respondents either mailed them back to the researcher or they were physically gathered by the researcher from the respondents.

Information gathering took roughly five months as the respondents were allowed to take as much time as they needed when filling in the surveys with no pressure. The length of the survey itself took approximately thirty-five minutes finish one poll. An aggregate of 134 polls was received from the respondents.
5.8 INSTRUMENT OF DATA COLLECTION

On one hand the survey was decided for this exploration as an information gathering instrument for the present investigation, and on the other hand, the survey characterized a poll as a printed self-report shape intended to draw data that can be gathered through the composed reactions of the subject. Consume and Grove (1993) additionally express that data gathered through a survey is like that acquired through a meeting, yet the inquiries have a tendency to have less profundity.

Data collection, with the support of the questionnaire, was to assess the causes, impacts, and method to mitigate construction negative impacts in Kinshasa, D.R.Congo.

There are two types of surveys; the shut finished and the open-finished polls. In the open-finished surveys the respondents are required to react in writing in their own words and giving more subtle elements as they wish, while in the shut finished polls, the respondents are given alternatives identified with the examination point which is controlled by the scientist (Burns and Grove 1993). Hence, a shut finished poll was utilized as a part of this exploration since it is simpler to control and examine.

Almost all the questionnaires were designed in English, with a few numbers of French models to direct respondents. Therefore, they could understand and fill the questions. All respondents were guaranteed the anonymity of their responses. The questionnaires include six sections; A, B, C, D, E and F. Section A was focused on receiving background
information data such as sex, age, ethnicity etc. The information gathered is going to help researcher while interpreting the findings.

Section B focused on the extent and level of concerns in which companies contribute to negative impacts. Section C focused measuring project-related factors in the company. Section D focused on the measure design-related problems which could affect the success of a project. Section E focused on evaluating the constraints faced by the construction company, and the last section of the questionnaire - section F - explored methods to mitigate negative impacts of construction activities on the environment in Kinshasa, D.R. Congo. The guidelines and instructions were added to the questionnaires.

Population density gives number of people divide by land area. Out of one hundred and eighty (180) of the copies of the questionnaires distributed, one hundred and thirty-four (134) were collected - which presents 75.5% response rate. This study is resumed on table 5.1 below. This was viewed as sufficient for examination in light of the statement by (Moser and Kalton, 1971) that the consequence of a study could be considered as one-sided and of little esteem if the arrival rate was lower than 30 to 40%.
Table 5.1: Questionnaire survey

<table>
<thead>
<tr>
<th>Survey Responses</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire sent out</td>
<td>180</td>
</tr>
<tr>
<td>Questionnaire received back</td>
<td>158</td>
</tr>
<tr>
<td>Usable questionnaire</td>
<td>136</td>
</tr>
<tr>
<td>Usable response rate (%)</td>
<td>76.9</td>
</tr>
</tbody>
</table>

This collected data, as illustrated in the table above, was reviewed and checked before analysis could take place. The frequency of the raw collected data was made using Exploratory Factors Analysis which was made at STATION.

5.9 PERIOD OF COLLECTION

The data was collected by the researcher in December 2016 to May 2017.
5.10 METHODS OF DATA ANALYSIS

5.10.1 MEANS ITEM SCORE (MIS)

A five and four scale point was adopted to present the cause and the impacts of the construction activities that affect the environment in Kinshasa, in accordance with determined factors from reviewed literature. The agreed scales were divided into four sets of scales.

The first set of the scale was as follows:

1. Large extent
2. Moderate extent
3. Small extent
4. No extent

The second set of the scale was as follows:

1. Extremely concerned
2. Somewhat concerned
3. Slightly concerned
4. Not at all concerned
The third set of the scale was as follows:

1. Always  
2. Often  
3. Sometimes  
4. Rarely  
5. Never

The fourth set of the scale was as follows:

1. Extremely likely  
2. Likely  
3. Neutral  
4. Unlikely  
5. Extremely unlikely

The five and four-point scale was converted to mean item score (MIS) for every single factor subject of this research as received from the respondents. The indices were then utilized to give the rank of each item. The methodology of the ranking made it possible for respondents to tick against the items according to the relevance to them. The analysis method was used for the data collection of the questionnaires survey.
A three-step process was used to capture results: the capturing of the related mean item score, the value found from the global weight of the answers and then linking it to the result answers on a particular aspect. Based on the rules that the respondents scored on each and every selected criterion, another consideration taken into account was the empirically determined indices of relative importance. The particular factors of MIS index are the actual scores of respondents summed (on the five and four-point scale), given by the global rated indicator which is an essential source of up to date information about the most important international growth.

The computation of the relative mean item score (MIS) was calculated from the total of all weighted responses and then relating it to the total responses on a particular aspect. This was based on the principle that respondents’ scores on all the selected criteria took together, are the empirically determined indices of relative necessity. The index of mean item score of a factor is the sum of respondents’ actual score (on the five and four scale) presented by the responses given e to that criterion.

A weighting was assigned to every response classified from one of the numbers for the dependencies of “extremely likely” to “extremely unlikely” and “extremely concerned” to “not at all concerned” The mean item score for each item was calculated as bellow, and can be explained mathematically as follows:

\[
MIS = \frac{1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5 + ... \sum N}{\sum N} \quad \text{... equation 1.0}
\]
Where,

\( n_1 = \) number of respondents for not at all concerned or extremely unlikely,

\( n_2 = \) number of respondents for slightly concerned or unlikely,

\( n_3 = \) number of respondents for somewhat concerned or neutral,

\( n_4 = \) number of respondents for extremely concerned or likely,

\( n_5 = \) numbers of respondents extremely likely.

\( N = \) numbers of respondents.

They are ranked following the criteria of the mathematical computations in descending order of their item score (from the high rated item to the lowest rated item).

5.10.2 DATA ANALYSIS

The data was collected from respondents and verified and checked before analyzing it. The raw data was then entered into Exploratory Factors Impacts (EFI) for the frequency analysis. The frequency of the distributions and percentages of the respondents was made using a data elaboration and analysis in utilizing frequency. The drawing of the frequency tables was from data by which pie chart diagrams, bar graphs, and tables were presented.
5.11 CONSISTENCY

The consistency internal check was directed using the consistency and reliability statistic measure of the Cronbach’s Alpha. The Cronbach’s Alpha of a test or scale is measuring the internal consistency - it gives details of the extent to which the broad items in a test measure the same concept or construct and hence it is connected to the inter-relatedness of the items within the test. In this study, the checking of internal consistency for items with the Cronbach’s Alpha gives the result of internal consistency of questions categories as provided by the findings in Table 5.2

**Table 5.2**: Consistency test using the Cronbach’s Alpha

<table>
<thead>
<tr>
<th>Category</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>The extent to which your company contributes to environmental negative impacts</td>
<td>0.860</td>
</tr>
<tr>
<td>Level of concern about impacts on the environment of your company</td>
<td>0.890</td>
</tr>
<tr>
<td>Impacts of contractors related</td>
<td>0.776</td>
</tr>
<tr>
<td>Impacts of consultants related</td>
<td>0.723</td>
</tr>
<tr>
<td>Impacts of materials related</td>
<td>0.779</td>
</tr>
<tr>
<td>Impacts of labors related</td>
<td>0.776</td>
</tr>
<tr>
<td>Impacts of external factors related</td>
<td>0.698</td>
</tr>
<tr>
<td>Causes of poor construction activities from the design</td>
<td>0.797</td>
</tr>
</tbody>
</table>
Causes of poor construction activities from the handling | 0.776
Causes of poor construction activities from the worker | 0.778
Causes of poor construction activities from the management | 0.721
Causes of poor construction activities from the site condition | 0.792
Causes of poor construction activities from the external factors | 0.826
Barriers faced in rising costs | 0.895
Barriers faced in time | 0.829
Barriers faced in quality | 0.834
Measures to mitigate construction negative impacts | 0.957

A Cronbach’s Alpha of 0.8 is probably a reasonable goal, as postulated by Gliem (2003), and further asserted by researchers George and Mallery (2003), who concluded that a Cronbach’s Alpha value above 0.7 is tolerable. Hence, the research started with analysis as the internal consistency test showed that the Cronbach’s Alpha contained unacceptable values, hence all items in the research were evaluating the similar concept and all the items were inter-related.

5.12 LIMITATION OF THE STUDY

This research assessment was just in view of the construction experts in Kinshasa, D.R.Congo. The respondents were architects, quantity surveyors, civil engineers, construction management, construction project managers, project managers and
different experts that are included in development extends to Kinshasa, D.R.Congo. This research decided elements of the construction activities that are causing negative impacts on the environment and their effects thereof, that while conducted in Kinshasa, D.R.Congo, measures of limiting their direct impact might also be used in other provinces or towns to form awareness.

5.13 ETHICAL CONSIDERATION

The current research did not experience or recognize any ethical issues, in any case, the ethical values have taken into consideration exigencies to the professional core in the field and they have contributed sensibly on some of the points in the literature. The commitment to the participants in the research questionnaires was that their information was kept confidential and only used for scholarship purposes. Respondents to the survey had the privilege not to answer questions that they were uncomfortable with. Respondents were not pressurized to answer questions and were not coerced into answering questions without free will.

A cover letter was written to have permission granted to carry out this research study. The letter was obtained from the University of Johannesburg, Department of Construction Management and Quantity Surveying, Doornfontein Campus. Questionnaires sent out were approved by the University.
Confidentiality and anonymity were kept up all through the investigation. Anonymity is a circumstance where the respondents can't be connected, even by the researchers, to their individual answers as written by Burns and Grove (1993).

5.14 CHAPTER SUMMARY

The chapter was conducted as described: it gives details on the population, sample, and instruments used for collection and strategies. Ethical values were taken into consideration and were adopted in this study. On the following chapter of this study, the dissertation of data analysis and discussions will be made.
CHAPTER SIX: DATA ANALYSIS OF THE QUESTIONNAIRES SURVEY RESULT

6.1 INTRODUCTION

This chapter will give us a brief look at what has been found during the questionnaire survey which has to be interpreted in the study, with the end goal leading to a conclusion and to give recommendations to the group’s target on the study made; architects, quantity surveyors, civil engineers, construction managers, construction project managers and other professionals that are involved in the construction project in the target area in the D.R.Congo.

The analysis of the data and interpretation of the results were obtained from the questionnaire study and it served as the basis of this quantitative and qualitative data collection. Almost all the questionnaires that were sent out got answered; which contained thirteen questions with hundred and fifty-one (151) sub-questions. The questionnaires collected are estimated at 76.9% response rate.

The first section of the questionnaires is the background and discussed the profiles of the respondents with regard to their demographic attributes, namely, gender, ethnicity, age group, professional qualification, years of experience, highest qualification, and type of employer.
The second section dealt with the negative impacts of the construction activities on the environment. The third section dealt with measures of construction-related issues. The fourth section dealt with measurement of design-related factors that affect project success. The fifth dealt with the barriers faced by the construction companies in achieving successful project outcomes. The sixth one had looked at the measures to regulate building construction activities on the environment in the province of Kinshasa, the capital of the D.R.Congo. Every single answer was taken into consideration.

6.2 BIOGRAPHICAL DATA

This part of the study discusses the profile of the respondents with regard to their demographic attribution namely; gender, ethnicity, age group, professional qualification, years of experience, and other highest degree.

6.2.1 BIOGRAPHICAL DATA FOUND

The finding of the 134 valid questionnaires showed that 70.7% of the respondents were male and 29.3% were female. The sub-question related to the age group were as follows:
### Table of Age groups I

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Respondents %</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-25 years old</td>
<td>7.6%</td>
</tr>
<tr>
<td>26-30 years old</td>
<td>15.2%</td>
</tr>
<tr>
<td>31-35 years old</td>
<td>27.3%</td>
</tr>
<tr>
<td>36-40 years old</td>
<td>17.4%</td>
</tr>
<tr>
<td>41-45 years old</td>
<td>6.8%</td>
</tr>
<tr>
<td>46-50 years old</td>
<td>6.1%</td>
</tr>
<tr>
<td>51-55 years old</td>
<td>12.9%</td>
</tr>
<tr>
<td>56 years old and above</td>
<td>6.8%</td>
</tr>
</tbody>
</table>
The ethnicity of the respondents was rank as follows:

**Table of ethnicity II**

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>African</td>
<td>69.9%</td>
</tr>
<tr>
<td>White</td>
<td>7.5%</td>
</tr>
<tr>
<td>Colored</td>
<td>18.8%</td>
</tr>
<tr>
<td>either Indian or Asian</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

The findings related to respondents’ professional qualification, results showed that 26.5% were an architect, 13.6% were quantity surveyors, 32.6 % civil engineers, 12.1% project managers, and the construction managers were 15.2%. Most of those who filled the other construction related experience were not filled properly that why we don’t have any other qualifications such as artisan, building inspector, electrical contractors, safety and site agent as well.

Therewith the result for the number of years of experiences is as follows:
Table of years of experience III

<table>
<thead>
<tr>
<th>Years experiences</th>
<th>respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.6%</td>
</tr>
<tr>
<td>1</td>
<td>5.5%</td>
</tr>
<tr>
<td>2</td>
<td>14.2%</td>
</tr>
<tr>
<td>3</td>
<td>14.2%</td>
</tr>
<tr>
<td>4</td>
<td>11.0%</td>
</tr>
<tr>
<td>5</td>
<td>8.7%</td>
</tr>
<tr>
<td>6</td>
<td>7.9%</td>
</tr>
<tr>
<td>7</td>
<td>7.9%</td>
</tr>
<tr>
<td>8</td>
<td>1.6%</td>
</tr>
<tr>
<td>9</td>
<td>3.9%</td>
</tr>
<tr>
<td>10</td>
<td>4.7%</td>
</tr>
</tbody>
</table>
The educational qualifications of the respondents were as follows:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>1.6%</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>3.9%</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1.6%</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1.6%</td>
<td></td>
</tr>
</tbody>
</table>
Table of education qualifications IV

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>diploma</td>
<td>1.5%</td>
</tr>
<tr>
<td>national diploma</td>
<td>41.4%</td>
</tr>
<tr>
<td>bachelor degree</td>
<td>36.8%</td>
</tr>
<tr>
<td>master’s degree</td>
<td>15.0%</td>
</tr>
<tr>
<td>doctorate</td>
<td>5.3%</td>
</tr>
</tbody>
</table>

Almost all questionnaires that were put aside provided approximately 40% of the information asked.

The same work further has shown that currently, a sector in which respondents are working were: 54.8% of the respondents work for the private sector and 45.2% work for the public sector.

The percentages of the number of the projects the respondents are currently working on are is as follows:
**Table of number of projects V**

<table>
<thead>
<tr>
<th>Number of projects</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 project</td>
<td>12.5%</td>
</tr>
<tr>
<td>1 projects</td>
<td>13.3%</td>
</tr>
<tr>
<td>2 projects</td>
<td>26.7%</td>
</tr>
<tr>
<td>3 projects</td>
<td>20.0%</td>
</tr>
<tr>
<td>4 projects</td>
<td>20.0%</td>
</tr>
<tr>
<td>5 projects</td>
<td>3.3%</td>
</tr>
<tr>
<td>6 projects</td>
<td>2.5%</td>
</tr>
<tr>
<td>9 projects</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

**6.2.2 DATA ANALYSIS**

Figure 6.1 shows that out of the 134 respondents, 70.7% were male, while 29.3% were females.
Findings that relate to the respondents’ age group as shown in Figure 7.2 below shows that 7.6% of the respondents were in the age group of 21-25 years old, 15.2% of the respondents were in the group age of 26-30 years old, 27.3% of the respondents were in the group age of 31-35 years old, 17.4% of the respondents were in the group age of 36-40 years old, 6.8% of the respondents were in the group age of 41-45 years old, 6.1% of the respondents were in the age group of 46-50 years old, 12.9% of the respondents were in the age group of 51-55 years old and the last group which is 6.8% were in the age group of 56 and above.
Figure 6.2: Respondents’ age group

Figure 6.3 below reveals the ethnicity of the respondents: 69.9% were African, 7.5% were White, 18.8% were colored and the 3.8% left was estimated as either Indian or Asian.

Figure 6.3: Respondents’ Ethnicity
Figure 6.4 gives the professional qualification of the respondents revealing that 26.5% were architects, 13.6% were quantity surveyors, 32.6% civil engineers, 12.1% project managers, and the construction managers were 15.2%. Most of those brackets in the experience section of questionnaires were not properly filled, that’s why we don’t have any other qualifications such as artisan, builder inspector, electrical contractors, safety and site agent as well.

![Figure 6.4: Respondents' professional qualification](image)

Figure 6.5 shows the working experience of the respondents in the industry, rated as follows:
# Table of worker experiences

<table>
<thead>
<tr>
<th>Worker experiences</th>
<th>respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.6%</td>
</tr>
<tr>
<td>1</td>
<td>5.5%</td>
</tr>
<tr>
<td>2</td>
<td>14.2%</td>
</tr>
<tr>
<td>3</td>
<td>14.2%</td>
</tr>
<tr>
<td>4</td>
<td>11.0%</td>
</tr>
<tr>
<td>5</td>
<td>8.7%</td>
</tr>
<tr>
<td>6</td>
<td>7.9%</td>
</tr>
<tr>
<td>7</td>
<td>7.9%</td>
</tr>
<tr>
<td>8</td>
<td>1.6%</td>
</tr>
<tr>
<td>9</td>
<td>3.9%</td>
</tr>
<tr>
<td>10</td>
<td>4.7%</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td>11</td>
<td>0.8%</td>
</tr>
<tr>
<td>12</td>
<td>2.4%</td>
</tr>
<tr>
<td>14</td>
<td>1.6%</td>
</tr>
<tr>
<td>15</td>
<td>3.9%</td>
</tr>
<tr>
<td>16</td>
<td>1.6%</td>
</tr>
<tr>
<td>17</td>
<td>0.8%</td>
</tr>
<tr>
<td>19</td>
<td>0.8%</td>
</tr>
<tr>
<td>20</td>
<td>2.4%</td>
</tr>
<tr>
<td>24</td>
<td>0.8%</td>
</tr>
<tr>
<td>25</td>
<td>2.4%</td>
</tr>
<tr>
<td>30</td>
<td>1.6%</td>
</tr>
</tbody>
</table>
**Figure 6.5:** Respondents’ years of experience in the industry

Figure 6.6 below illustrates the highest qualification the respondents obtained. The breakdown is as follows:
# Table of highest qualifications II

<table>
<thead>
<tr>
<th>Highest qualifications</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>certificate diploma</td>
<td>1.5%</td>
</tr>
<tr>
<td>national diploma</td>
<td>41.4%</td>
</tr>
<tr>
<td>bachelor degree</td>
<td>36.8%</td>
</tr>
<tr>
<td>master's degree</td>
<td>15.0%</td>
</tr>
<tr>
<td>doctorate</td>
<td>5.3%</td>
</tr>
</tbody>
</table>

Almost all questionnaires that were put aside provided approximately 40% of the information asked.
Figure 6.6: Highest qualification

Figure 6.7 depicts the current sector in which respondents are working for; 54.8% of the respondents work for the private sector and 45.2% work for the public sector.

![Sector in which the respondent is currently working in](image)

**Figure 6.7:** Sector in which the respondent is currently working in

Figure 6.8 gives us the number of projects the respondents are currently working on. 12.5% of the respondents had 0 project, 13.3% of the respondents had 1 projects, 26.7% of the respondents had 2 projects, 20.0% of the respondents had 3 projects, 20.0% of the respondents had 4 projects, 3.3% of the respondents had 5 projects, 2.5% of the respondents had 6 projects and 1.7% of the respondents had 9 projects.
6.2.2.1 SECTION B: NEGATIVE IMPACT OF THE CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

Table 6.1 shows the respondents’ ranking of the factors that cause negative impacts of the construction activities on the environment. Five scales were used for the section A; no extent (NE), small extent (SE), moderate extent (ME) and large extent (LE). For section B the scales were; not at all concerned (NC), slightly concerned (SC), somewhere concerned (SC) and extremely concerned (EC). Respondents were asked to tick on the answer that they perceived as the right procedure to be implemented in the construction industry against the negative impacts of the construction activities on the environment.

Table 6.1 below discloses the respondents’ ranking of what they perceived were negative impacts of the construction activities on the environment of the Kinshasa. Looking at the which the company contributes to, the finding reveals that, dust generation with
construction machinery was classified first with a mean score of 2.96 and the standard deviation of 0.559 same as air pollution with a mean score of 2.96 and the standard deviation of 0.559 and on the second position land pollution with a mean score of 2.94 and the standard deviation of 0.584, generation of inert waste was ranked third with a mean score of 2.94 and the standard deviation of 0.661 and waste generation was fourth with a mean score of 2.93 and the standard deviation of 0.661 the same as noise pollution with a mean score of 2.93 and the standard deviation of 0.646 with soil erosion in the fifth position with a mean score of 2.89 and the standard deviation of 0.640.

Spread of undesirable diseases in sixth position with a mean score of 2.84 and the standard deviation of 0.697 same as water pollution with a mean score of 2.84 and the standard deviation of 0.668 follows by disturbance of the temperature on the seventh position with a mean score of 2.82 and the standard deviation of 0.653, landscape alteration was on the eighth position with a mean score of 2.78 and the standard deviation of 0.609 likewise the natural disaster was in the ninth position with a mean score of 2.76 and the standard deviation of 0.707 then comes radiation exposure with a mean score of 2.73 and the standard deviation of 0.782 and chemical pollution in the last position which eleventh with a mean score of 2.71 and the standard deviation of 0.620.
Table 6.1: Negative impacts of construction activities on the environment

<table>
<thead>
<tr>
<th>Negative impact</th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust generation with construction machinery</td>
<td>2.96</td>
<td>0.559</td>
<td>1</td>
</tr>
<tr>
<td>Air pollution</td>
<td>2.96</td>
<td>0.559</td>
<td>1</td>
</tr>
<tr>
<td>Land pollution</td>
<td>2.95</td>
<td>0.584</td>
<td>2</td>
</tr>
<tr>
<td>Generation of inert waste</td>
<td>2.94</td>
<td>0.557</td>
<td>3</td>
</tr>
<tr>
<td>Waste generation</td>
<td>2.93</td>
<td>0.661</td>
<td>4</td>
</tr>
<tr>
<td>Noise pollution</td>
<td>2.93</td>
<td>0.646</td>
<td>4</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>2.89</td>
<td>0.640</td>
<td>5</td>
</tr>
<tr>
<td>Spread of undesirable diseases</td>
<td>2.84</td>
<td>0.697</td>
<td>6</td>
</tr>
<tr>
<td>Water pollution</td>
<td>2.84</td>
<td>0.668</td>
<td>6</td>
</tr>
<tr>
<td>Disturbance of the temperature</td>
<td>2.82</td>
<td>0.653</td>
<td>7</td>
</tr>
<tr>
<td>Landscape alteration</td>
<td>2.78</td>
<td>0.609</td>
<td>8</td>
</tr>
<tr>
<td>Natural disaster</td>
<td>2.76</td>
<td>0.707</td>
<td>9</td>
</tr>
<tr>
<td>Radiation exposure</td>
<td>2.73</td>
<td>0.782</td>
<td>10</td>
</tr>
<tr>
<td>Chemical pollution</td>
<td>2.71</td>
<td>0.620</td>
<td>11</td>
</tr>
</tbody>
</table>

*SD= standard deviation; MS= means score; R= rank*
Table 6.2 below discloses the respondents' ranking of what they perceived were negative impacts of the construction activities on the environment of the Kinshasa by looking at the level of concern about impact on environment. The finding reveals that spread of undesirable diseases was at first with a mean score of 2.95 and the standard deviation of 0.713, waste generation was the second with a mean score of 2.92 and the standard deviation of 0.612, on the third position air pollution with a mean score of 2.90 and the standard deviation of 0.708 as well as the disturbance of the temperature with a mean score of 2.90 and the standard deviation of 0.572, water pollution was ranked on the fourth position with a mean score of 2.86 and the standard deviation of 0.636.

The dust generation with construction machinery was the fifth one with a mean score of 2.85 and the standard deviation of 0.736 same as generation of inert waste with a mean score of 2.85 and the standard deviation of 0.658, noise pollution was ranked on the sixth position with a mean score of 2.83 and the standard deviation of 0.701, land pollution was ranked on the sixth position with a mean score of 2.83 and the standard deviation of 0.701, landscape alteration was ranked on the seventh position with a mean score of 2.80 and the standard deviation of 0.635, soil erosion was ranked in the eighth with a mean score of 2.75 and the standard deviation of 0.702, radiation exposure was position in the ninth with a mean score of 2.74 and the standard deviation of 0.706 with the chemical pollution on the tenth position with a mean score of 2.72 and the standard deviation of 0.632 and on the last position which is eleventh natural disaster with a mean score of 2.69 and the standard deviation of 0.659.
Table 6.2: Level of concern about the impact on the environment

<table>
<thead>
<tr>
<th>Environmental Impact</th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spread of undesirable diseases</td>
<td>2.95</td>
<td>0.713</td>
<td>1</td>
</tr>
<tr>
<td>Waste generation</td>
<td>2.92</td>
<td>0.612</td>
<td>2</td>
</tr>
<tr>
<td>Air pollution</td>
<td>2.90</td>
<td>0.708</td>
<td>3</td>
</tr>
<tr>
<td>Disturbance of the temperature</td>
<td>2.90</td>
<td>0.572</td>
<td>3</td>
</tr>
<tr>
<td>Water pollution</td>
<td>2.86</td>
<td>0.636</td>
<td>4</td>
</tr>
<tr>
<td>Dust generation with construction machinery</td>
<td>2.85</td>
<td>0.736</td>
<td>5</td>
</tr>
<tr>
<td>Generation of inert waste</td>
<td>2.85</td>
<td>0.658</td>
<td>5</td>
</tr>
<tr>
<td>Noise pollution</td>
<td>2.83</td>
<td>0.701</td>
<td>6</td>
</tr>
<tr>
<td>Land pollution</td>
<td>2.83</td>
<td>0.701</td>
<td>6</td>
</tr>
<tr>
<td>Landscape alteration</td>
<td>2.80</td>
<td>0.635</td>
<td>7</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>2.75</td>
<td>0.702</td>
<td>8</td>
</tr>
<tr>
<td>Radiation exposure</td>
<td>2.74</td>
<td>0.706</td>
<td>9</td>
</tr>
<tr>
<td>Chemical pollution</td>
<td>2.72</td>
<td>0.632</td>
<td>10</td>
</tr>
<tr>
<td>Natural disaster</td>
<td>2.69</td>
<td>0.659</td>
<td>11</td>
</tr>
</tbody>
</table>

*SD* = standard deviation; *MS* = means score; *R* = rank
6.2.2.2 SECTION C: MEASUREMENT OF CONSTRUCTION RELATED ISSUES

Table 6.3 discloses the respondents’ ranking of perceived measurement of construction-related issues of the Kinshasa construction looking at the level importance, using a scoring system; always (A), often (O), sometimes (ST), rarely (R) and never (N). These are linked on each part that might affect the success of a project contractor, consultant, material, labors and external factors.

On the first position the frequent change of subcontractors with a mean score of 2.99 and the standard deviation of 0.682 the second was poor execution with a mean score of 2.93 and the standard deviation of 0.795 the third was improper statements interpretation with a mean score of 2.91 and the standard deviation of 0.721, fourthly followed by poor qualification of the constructor’s staff with a mean score of 2.85 and the standard deviation of 0.764, site mobilization on the fifth position with a mean score of 2.84 and the standard deviation of 0.673 and rework due to errors during construction sixth position with a mean score of 2.71 and the standard deviation of 0.712.
Table 6.3: General contractor related

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent changes of sub-contractors</td>
<td>2.99</td>
<td>0.682</td>
<td>1</td>
</tr>
<tr>
<td>Poor execution</td>
<td>2.93</td>
<td>0.795</td>
<td>2</td>
</tr>
<tr>
<td>Improper statements interpretation</td>
<td>2.91</td>
<td>0.721</td>
<td>3</td>
</tr>
<tr>
<td>Poor qualification of the contractor’s staff</td>
<td>2.85</td>
<td>0.764</td>
<td>4</td>
</tr>
<tr>
<td>Site mobilization</td>
<td>2.84</td>
<td>0.673</td>
<td>5</td>
</tr>
<tr>
<td>Rework due to errors during construction</td>
<td>2.71</td>
<td>0.712</td>
<td>6</td>
</tr>
</tbody>
</table>

SD = standard deviation; MS = means score; R = rank

Table 6.4 illustrates the respondents’ ranking of perceived measurements of construction-related issues of Kinshasa construction looking at the level of importance of consultant-related factors. which is as first Mistakes and inconsistencies in design documents with a mean score of 3.15 and the standard deviation of 0.714 followed secondly by insufficient data collection and survey before design with a mean score of 3.03 and the standard deviation of 0.712, unclear and inadequate details in drawings on the third position with a mean score of 2.98 and the standard deviation of 0.744, poor coordination ranked fourth with a mean score of 2.97 and the standard deviation of 0.764 in the fifth position the lack of experience with a mean score of 2.94 and the standard deviation of 0.762 on the last position which is the sixth the delay in approving major
changes in the scope of work with a mean score of 2.91 and the standard deviation of 0.759.

**Table 6.4: General consultant related**

<table>
<thead>
<tr>
<th>Mistakes and inconsistencies in design documents</th>
<th>3.15</th>
<th>0.714</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient data collection and survey before design</td>
<td>3.03</td>
<td>0.712</td>
<td>2</td>
</tr>
<tr>
<td>Unclear and inadequate details in drawings</td>
<td>2.98</td>
<td>0.744</td>
<td>3</td>
</tr>
<tr>
<td>Poor coordination</td>
<td>2.97</td>
<td>0.764</td>
<td>4</td>
</tr>
<tr>
<td>Lack of experience</td>
<td>2.94</td>
<td>0.762</td>
<td>5</td>
</tr>
<tr>
<td>Delay in approving major changes in the scope of work</td>
<td>2.91</td>
<td>0.759</td>
<td>6</td>
</tr>
</tbody>
</table>

*SD = standard deviation; MS = means score; R = rank*

Table 6.5 below outlines the respondents’ ranking of what they perceived were the measurements of construction-related issues of Kinshasa construction looking at the level importance of material related factors.
Table 6.5: general materials

<table>
<thead>
<tr>
<th>Issue</th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering wrong material</td>
<td>3.11</td>
<td>0.736</td>
<td>1</td>
</tr>
<tr>
<td>Delivery of wrong material</td>
<td>3.05</td>
<td>0.700</td>
<td>2</td>
</tr>
<tr>
<td>Delay in material delivery</td>
<td>3.04</td>
<td>0.759</td>
<td>3</td>
</tr>
<tr>
<td>Shortage of equipment</td>
<td>3.04</td>
<td>0.788</td>
<td>3</td>
</tr>
<tr>
<td>Lateness in material ordering</td>
<td>3.02</td>
<td>0.690</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate material storage</td>
<td>3.01</td>
<td>0.789</td>
<td>5</td>
</tr>
<tr>
<td>Damage of sorted material while needed urgently</td>
<td>2.96</td>
<td>0.728</td>
<td>6</td>
</tr>
<tr>
<td>Changes of material types during construction</td>
<td>2.94</td>
<td>0.721</td>
<td>7</td>
</tr>
<tr>
<td>Equipment breakdowns</td>
<td>2.88</td>
<td>0.765</td>
<td>8</td>
</tr>
</tbody>
</table>

SD= standard deviation; MS= means score; R= rank

Table 6.6 below demonstrates the respondents’ ranking of their perception of the measurement of construction-related issues of Kinshasa construction looking at the level importance of the labor-related issues.

which is on the first position: Inexperience of workers with a mean score of 3.08 and the standard deviation of 0.790, laziness in executions on the second position with a mean score of 3.04 and the standard deviation of 0.891 as well as lacks of communication among workers with a mean score of 3.04 and the standard deviation of 0.747 followed
by low productivity level of works on the third position with a mean score of 2.95 and the standard deviation of 0.802 and shortage of labor in the fourth position, the last with a mean score of 2.92 and the standard deviation of 0.749.

**Table 6.6:** General labor

<table>
<thead>
<tr>
<th>Inexperience of workers</th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.08</td>
<td>0.790</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laziness in executions</th>
<th>3.04</th>
<th>0.891</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of communication among workers</td>
<td>3.04</td>
<td>0.747</td>
<td>2</td>
</tr>
<tr>
<td>Low productivity level of workers</td>
<td>2.95</td>
<td>0.802</td>
<td>3</td>
</tr>
<tr>
<td>Shortage of labor</td>
<td>2.92</td>
<td>0.749</td>
<td>4</td>
</tr>
</tbody>
</table>

*SD= standard deviation; MS= means score; R= rank*

Table 6.7 below shows the respondents’ ranking of what they perceived were the measurements of construction-related issues of Kinshasa construction looking at the level importance the external related factors.

Related which is Change in government on the first position with a mean score of 3.21 and the standard deviation of 0.770, natural disasters on the second position with a mean score of 3.15 and the standard deviation of 0.733, traffic control and restriction on sites on the third position with a mean score of 3.09 and the standard deviation of 0.747
followed by change in economic factors on the fourth position with a mean score of 3.05 and the standard deviation of 0.802, delay in providing services from utilities on the fifth position with a mean score of 3.03 and the standard deviation of 0.588, effects of subsurface and ground conditions on the sixth position with a mean score of 3.01 and the standard deviation of 0.634 followed by delay in obtaining permits from municipality on the seventh position with a mean score of 3.00 and the standard deviation of 0.721 and the delay in performing final inspection and certification come at last on the eighth position with mean score of 2.86 and the standard deviation of 0.637.

**Table 6.7**: General external factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in government regulation and laws</td>
<td>3.21</td>
<td>0.770</td>
<td>1</td>
</tr>
<tr>
<td>Natural disasters</td>
<td>3.15</td>
<td>0.733</td>
<td>2</td>
</tr>
<tr>
<td>Traffic control and restriction on sites</td>
<td>3.09</td>
<td>0.747</td>
<td>3</td>
</tr>
<tr>
<td>Change in economic factors</td>
<td>3.05</td>
<td>0.802</td>
<td>4</td>
</tr>
<tr>
<td>Delay in providing services from utilities</td>
<td>3.03</td>
<td>0.588</td>
<td>5</td>
</tr>
<tr>
<td>Effects of subsurface and ground conditions</td>
<td>3.01</td>
<td>0.634</td>
<td>6</td>
</tr>
<tr>
<td>Delay in obtaining permits from the municipality</td>
<td>3.00</td>
<td>0.721</td>
<td>7</td>
</tr>
<tr>
<td>Delay in performing final inspection and certification</td>
<td>2.86</td>
<td>0.637</td>
<td>8</td>
</tr>
</tbody>
</table>

*SD= standard deviation; MS= means score; R= rank*
6.2.2.3 SECTION D: MEASUREMENT OF DESIGN RELATED FACTORS THAT AFFECT PROJECT SUCCESS

Table 6.8 below discloses the respondents' ranking of their perception of the measurement of design-related factors that affect project success of the Kinshasa construction looking at the level importance. Using the following measures: extremely unlikely (EU), unlikely (U), neutral (N), likely (L) and extremely likely (EL) on the same wave design-related factors.

which is wrong compilation of designs on the first position with a mean score of 3.27 and the standard deviation of 0.818, poor design quality on the second position with a mean score of 3.16 and the standard deviation of 0.714, inexperienced designer on the third position with a mean score of 3.13 and the standard deviation of 0.765 followed by design errors on the fourth position with mean score of 3.10 and the standards deviation of 0.863 and frequent design changes on the last position which the last with mean score of 3.06 and the standard deviation of 0.725
Table 6.8: Design as a Design-related factor

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrong compilation of designs</td>
<td>3.27</td>
<td>0.818</td>
<td>1</td>
</tr>
<tr>
<td>Poor design quality</td>
<td>3.16</td>
<td>0.714</td>
<td>2</td>
</tr>
<tr>
<td>Inexperienced designer</td>
<td>3.13</td>
<td>0.765</td>
<td>3</td>
</tr>
<tr>
<td>Design errors</td>
<td>3.10</td>
<td>0.863</td>
<td>4</td>
</tr>
<tr>
<td>Frequent design changes</td>
<td>3.06</td>
<td>0.725</td>
<td>5</td>
</tr>
</tbody>
</table>

SD = standard deviation; MS = means score; R = rank

Table 6.9: discloses the respondents’ ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance of handling on site.

Which is Poor material handling on the first position with a mean score of 3.37 and the standard deviation of 0.746 followed by the poor quality of materials on the second position with a mean score of 3.34 and the standard deviation of 0.763, wrong material storage on the third position with a mean score of 3.31 and the standard deviation of 0.817 likewise equipment failure (breakdown) on the fourth position with a mean score of 3.25 and the standard deviation of 0.726 and the tools not suitable for the fifth position with a mean score of 3.22 and the standard deviation of 0.717.
<table>
<thead>
<tr>
<th>Poor material handling</th>
<th>3.37</th>
<th>0.746</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor quality of materials</td>
<td>3.34</td>
<td>0.763</td>
<td>2</td>
</tr>
<tr>
<td>Wrong material storage</td>
<td>3.31</td>
<td>0.817</td>
<td>3</td>
</tr>
<tr>
<td>Equipment failure (breakdown)</td>
<td>3.25</td>
<td>0.726</td>
<td>4</td>
</tr>
<tr>
<td>Tools not suitable</td>
<td>3.22</td>
<td>0.717</td>
<td>5</td>
</tr>
</tbody>
</table>

**Table 6.9: design: handling**

SD= standard deviation; MS= means score; R= rank

Table 6.10: discloses the respondents’ ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance of workers.

disclose the respondents ranking of the right they perceived were the measurement of design-related factors that affect project success in the Kinshasa construction looking at the level importance which is a lot of overtime for working on the first place with a mean score of 3.39, and a standard deviation of 0.776 on the second place poor understanding of environmental assessment with a mean score of 3.29 and the standard deviation of 0.744, shortage of skilled workers in the third position with the a mean score of 3.26 and a standard deviation of 0.835 and there come poor communication between workers on the fourth position with a mean score of 3.25 and the standard deviation of 0.860, Workers’
mistakes on the fifth position with a mean score of 3.22 and the standard deviation of 0.752 followed by lack of experience in the last position with a mean score of 3.20 and the standard deviation of 0.807.

**Table 6.10:** Design: worker

<table>
<thead>
<tr>
<th>A lot of overtime for worker</th>
<th>3.39</th>
<th>0.776</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor understanding of environmental assessment</td>
<td>3.29</td>
<td>0.744</td>
<td>2</td>
</tr>
<tr>
<td>Shortage of skilled workers</td>
<td>3.26</td>
<td>0.835</td>
<td>3</td>
</tr>
<tr>
<td>Poor communication between workers</td>
<td>3.25</td>
<td>0.860</td>
<td>4</td>
</tr>
<tr>
<td>Workers’ mistakes</td>
<td>3.22</td>
<td>0.752</td>
<td>5</td>
</tr>
<tr>
<td>Lack of experience</td>
<td>3.20</td>
<td>0.807</td>
<td>6</td>
</tr>
</tbody>
</table>

*SD* = standard deviation; *MS* = means score; *R* = rank

Table 6.11: discloses the respondents' ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance of scale design management.

Disclose the respondents ranking of the right they perceived were the measurement of design-related factors that affect project success in the Kinshasa construction looking at
the level importance which is Lack of coordination among parties in the first position with a mean score of 3.38 and the standard deviation of 0.711 on the second place poor supervision with a mean score of 3.32 and a standard deviation of 0.763, lack of environmental awareness on the third position with mean score of 3.27 and the standard deviation of 0.808 followed by non-availability of equipment on the fourth position with a mean score of 3.26 and the standard deviation of 0.786 and at last poor planning on the fifth position with a mean score of 3.25 and the standard deviation of 0.887.

**Table 6.11:** scale design: management

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of coordination among parties</td>
<td>3.38</td>
<td>0.711</td>
<td>1</td>
</tr>
<tr>
<td>Poor supervision</td>
<td>3.32</td>
<td>0.763</td>
<td>2</td>
</tr>
<tr>
<td>Lack of environmental awareness</td>
<td>3.27</td>
<td>0.808</td>
<td>3</td>
</tr>
<tr>
<td>Non availability of equipment</td>
<td>3.26</td>
<td>0.786</td>
<td>4</td>
</tr>
<tr>
<td>Poor planning</td>
<td>3.25</td>
<td>0.887</td>
<td>5</td>
</tr>
</tbody>
</table>

*SD= standard deviation; MS= means score; R= rank*

Table 6.12: discloses the respondents’ ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance of design site conditions.
disclose the respondents ranking of the right they perceived were the measurement of design-related factors that affect project success in the Kinshasa construction looking at the level importance which is Crew interference on the first position with mean score of 3.31 and the standard deviation of 0.795 on the second position congestion of the site with a mean score of 3.24 and a standard deviation of 0.840, waste pile over time on the third position with a mean score of 3.20 and standard deviation of 0.779 followed by poor site condition on the fourth position with a mean score 3.18 and the standard deviation of 0.855, light problem on the fifth position with a mean score of 3.17 and the standard deviation of 0.833 and on the sixth position leftover material on site which is the last with a mean score of 3.14 and the standard deviation of 0.762
Table 6.12: Design site condition

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crews interference</td>
<td>3.31</td>
<td>0.795</td>
<td>1</td>
</tr>
<tr>
<td>Congestion of the</td>
<td>3.24</td>
<td>0.840</td>
<td>2</td>
</tr>
<tr>
<td>site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste pile over time</td>
<td>3.20</td>
<td>0.779</td>
<td>3</td>
</tr>
<tr>
<td>Poor site condition</td>
<td>3.18</td>
<td>0.855</td>
<td>4</td>
</tr>
<tr>
<td>Lighting problem</td>
<td>3.17</td>
<td>0.833</td>
<td>5</td>
</tr>
<tr>
<td>Leftover material on</td>
<td>3.14</td>
<td>0.762</td>
<td>6</td>
</tr>
<tr>
<td>site</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD= standard deviation; MS= means score; R= rank

Table 6.13: discloses the respondents’ ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance of procurement factors.

disclose the respondents ranking of the right they perceived were the measurement of design-related factors that affect project success in the Kinshasa construction looking at the level importance which is Shipment errors in the first position with a mean score of 3.38 and the standard deviation of 0.779 on the second position ignorance of specifications with a mean score of 3.31 and the standard deviation of 0.775 followed by
waiting for replacement on the third position with a mean score of 3.22 and the standard deviation of 0.797 likewise on the fourth position ordering errors with a mean score of 3.18 and the standard deviation of 0.779 at last mistakes in quantity surveys on the fifth position with a standard deviation of 3.13 and the 0.788.

Table 6.13: design procurement

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipment errors</td>
<td>3.38</td>
<td>0.779</td>
<td>1</td>
</tr>
<tr>
<td>Ignorance of specifications</td>
<td>3.31</td>
<td>0.775</td>
<td>2</td>
</tr>
<tr>
<td>Waiting for replacement</td>
<td>3.22</td>
<td>0.797</td>
<td>3</td>
</tr>
<tr>
<td>Ordering errors</td>
<td>3.18</td>
<td>0.779</td>
<td>4</td>
</tr>
<tr>
<td>Mistakes in quantity surveys</td>
<td>3.13</td>
<td>0.788</td>
<td>5</td>
</tr>
</tbody>
</table>

SD= standard deviation; MS= means score; R= rank

Table 6.14: discloses the respondents' ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance.

provide the respondents ranking of the right they perceived were the measurement of design-related factors that affect project success in the Kinshasa construction looking at the level importance which is Lack of law enforcement on the first position with a mean
score 3.50 and the standard deviation of 0.966, unpredictable socioeconomic conditions on the second position with 3.48 and the standard deviation of 0.942 on the third position weather conditions with a mean score of 3.45 and the standard deviation of 0.898 followed by accidents on the fourth position with a mean score of 3.35 and the standard deviation of 0.895, pilferage on the fifth position with a mean score of 3.32 and the standard deviation of 0.932 and on the last position vandalism which is the sixth position with a mean score of 3.21 and the standard deviation of 0.938.

**Table 6.14:** Design external

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of law enforcement</td>
<td>3.50</td>
<td>0.966</td>
<td>1</td>
</tr>
<tr>
<td>Unpredictable socioeconomic conditions</td>
<td>3.48</td>
<td>0.942</td>
<td>2</td>
</tr>
<tr>
<td>Weather conditions</td>
<td>3.45</td>
<td>0.898</td>
<td>3</td>
</tr>
<tr>
<td>Accidents</td>
<td>3.35</td>
<td>0.895</td>
<td>4</td>
</tr>
<tr>
<td>Pilferage</td>
<td>3.32</td>
<td>0.932</td>
<td>5</td>
</tr>
<tr>
<td>Vandalism</td>
<td>3.21</td>
<td>0.938</td>
<td>6</td>
</tr>
</tbody>
</table>

*SD = standard deviation; MS = means score; R = rank*
6.2.2.4 SECTION E: BARRIERS FACED BY THE CONSTRUCTION COMPANIES IN ACHIEVING SUCCESSFUL PROJECT OUTCOMES

Table 6.15 discloses the respondents' ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance of rising costs. Factors were measured using the variables.

Disclose the respondents ranking of the right they perceived were the barriers faced by construction in achieving successful project outcomes in the Kinshasa construction looking at the level importance extremely likely (EL), unlikely (U), neutral (N), likely (L) and extremely unlikely (EU), with Inflation on the first position with a mean score of 3.54 and the standard deviation of 1.083, secondly poor quality equipment with mean score of 3.53 and the standard deviation of 0.969 on the third position lack of materials and supplies with a mean score of 3.51 and the standard deviation 1.054, long time delay on the fourth position with a mean score of 3.45 and the standard deviation of 1.046 and increase in wage which is the fifth one with a mean score of 3.38 and the standard deviation of 1.154.
Table 6.15: Barriers rising costs

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>3.54</td>
<td>1.083</td>
<td>1</td>
</tr>
<tr>
<td>Poor quality equipment</td>
<td>3.53</td>
<td>0.969</td>
<td>2</td>
</tr>
<tr>
<td>Lack of materials &amp; supplies</td>
<td>3.51</td>
<td>1.054</td>
<td>3</td>
</tr>
<tr>
<td>Long time delay</td>
<td>3.45</td>
<td>1.046</td>
<td>4</td>
</tr>
<tr>
<td>Increase in wages</td>
<td>3.38</td>
<td>1.154</td>
<td>5</td>
</tr>
</tbody>
</table>

*SD = standard deviation; MS = means score; R = rank*

Table 6.16: discloses the respondents’ ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance influenced by time-related factors. Disclose the respondents ranking of the right they perceived were the barriers faced by the construction in achieving successful project outcomes in the Kinshasa construction looking at the level importance which is Changes on the first position with a mean score of 3.44 and the standard deviation of 0.799 followed by slow delivery of materials and supplies on the second position with a mean score of 3.43 and the standard deviation of 0.818, delay in the construction schedule on the third position with a mean score of 3.37 and the standard deviation of 0.791 followed by government restraints on the fourth
position with a mean score of 3.27 and the standard deviation of 0.916 as well as delay in the design schedule with a mean score of 3.27 and the standard deviation of 0.873.

**Table 6.16:** Barriers: time

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes</td>
<td>3.44</td>
<td>0.799</td>
<td>1</td>
</tr>
<tr>
<td>Slow delivery of materials &amp; supplies</td>
<td>3.43</td>
<td>0.818</td>
<td>2</td>
</tr>
<tr>
<td>Delays in the construction schedule</td>
<td>3.37</td>
<td>0.791</td>
<td>3</td>
</tr>
<tr>
<td>Government restraints</td>
<td>3.27</td>
<td>0.916</td>
<td>4</td>
</tr>
<tr>
<td>Delays in the design schedule</td>
<td>3.27</td>
<td>0.873</td>
<td>4</td>
</tr>
</tbody>
</table>

*SD = standard deviation; MS = means score; R = rank*

Table 6.16: discloses the respondents' ranking of what they perceived as the measurement of design-related factors that affect the success of projects in Kinshasa construction by looking at the level importance due to quality-related factors.

Disclose the respondents ranking of the right they perceived were the measurement of design-related factors in the Kinshasa construction looking at the level importance which is Lack of finance on the first position with a mean score of 3.52 and the standard
deviation of 1.065 on the second position availability of materials with a mean score of 3.48 and the standard deviation of 0.966, lacks of skilled workers on the third position with a mean score of 3.43 and the standard deviation of 0.940, poor quality supervision on the fourth position with a mean score 3.41 and the standard deviation of 0.904 followed by inspection on the fifth position with a mean score of 3.31 and the standard deviation of 0.939 and poor design criteria with a mean score of 3.30 and the standard deviation of 0.937.

**Table 6.17:** Barriers: quality

<table>
<thead>
<tr>
<th></th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of finance</td>
<td>3.52</td>
<td>1.065</td>
<td>1</td>
</tr>
<tr>
<td>Availability of materials</td>
<td>3.48</td>
<td>0.966</td>
<td>2</td>
</tr>
<tr>
<td>Lack of skilled workers</td>
<td>3.43</td>
<td>0.940</td>
<td>3</td>
</tr>
<tr>
<td>Poor quality supervision</td>
<td>3.41</td>
<td>0.904</td>
<td>4</td>
</tr>
<tr>
<td>Inspection</td>
<td>3.31</td>
<td>0.939</td>
<td>5</td>
</tr>
<tr>
<td>Poor design criteria</td>
<td>3.30</td>
<td>0.937</td>
<td>6</td>
</tr>
</tbody>
</table>

*SD= standard deviation; MS= means score; R= rank*
6.2.2.5 SECTION F: MEASURES TO REGULATE BUILDING CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

Table 6.18: discloses the respondents’ ranking of what they perceived when they looked at the measures to regulate building construction activities on the environment in Kinshasa construction according to the level importance of regulations, using these measures to gauge responses; extremely likely(EL), unlikely(U), neutral(N), likely(L) and extremely likely(EL), with the use of appropriate construction methods on the first position with a mean score of 3.67 and the standard deviation of 1.014, proper pre-contract planning on the second position with a mean score of 3.63 and the standard deviation of 0.848 same as employment of experienced site workers with a mean score of 3.63 and the standard deviation of 0.921, adequate pre-contract project coordination on the third position with a mean score of 3.62 and the standard deviation of 0.769 followed by ordering the right materials on the fourth position with a mean score of 3.59 and the standard deviation of 1.017, proper project implementation and management on the fifth position with a mean score of 3.58 and the standard deviation of 0.927.

Appointment of highly experienced committed design team to the sixth position with a mean score of 3.55 and the standard deviation of 0.920 same as proper implementation of local regulation with a mean score of 3.55 and the standard deviation of 0.987 on the seventh position decrease variation of order with a mean score of 3.54 and the standard deviation of 0.894 same as time supply of materials with a mean score of 3.54 and the
standard deviation of 0.920 likewise appointment of high experienced technical consultant with a mean score of 3.54 and the standard deviation of 0.980 on the same rate reliability pre-contract estimations with a mean score of 3.54 and the standard deviation of 0.885.

Completed design at the time of tender on the eighth position with a mean score 3.52 and the standard deviation of 0.955, use of up-to-date technology on the ninth position with a mean score 3.50 and the standard deviation of 0.829, appointment of experienced contractors to the tenth position with a mean score of 3.49 and the stand deviation of 0.989 same as comprehensive client brief development with a mean score of 3.49 and the standard deviation of 0.912, allocation of adequate project duration on the eleventh position with 3.48 and the standard deviation of 0.858, adequate planning on the twelfth position with 3.46 and the standard deviation of 0.989, good workmanships on the thirteenth with a mean score of 3.44 and the standard deviation of 0.954 and adequate design on the last position with a mean score of 3.42 and the standard deviation of 0.993.
### Table 6.18: Measures to regulate

<table>
<thead>
<tr>
<th>Measure</th>
<th>MS</th>
<th>SD</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of appropriate construction methods</td>
<td>3.67</td>
<td>1.014</td>
<td>1</td>
</tr>
<tr>
<td>Proper pre-contract planning</td>
<td>3.63</td>
<td>0.848</td>
<td>2</td>
</tr>
<tr>
<td>Employment of experienced site workers</td>
<td>3.63</td>
<td>0.921</td>
<td>2</td>
</tr>
<tr>
<td>Adequate pre-contract project coordination</td>
<td>3.62</td>
<td>0.769</td>
<td>3</td>
</tr>
<tr>
<td>Proper pre-contract planning</td>
<td>3.59</td>
<td>1.017</td>
<td>4</td>
</tr>
<tr>
<td>Ordering the right materials</td>
<td>3.58</td>
<td>0.927</td>
<td>5</td>
</tr>
<tr>
<td>Proper project implementation and management</td>
<td>3.55</td>
<td>0.920</td>
<td>6</td>
</tr>
<tr>
<td>Appointment of the highly experienced committed design team</td>
<td>3.55</td>
<td>0.987</td>
<td>6</td>
</tr>
<tr>
<td>Proper implementation of local regulation</td>
<td>3.54</td>
<td>0.894</td>
<td>7</td>
</tr>
<tr>
<td>Decrease variation of orders</td>
<td>3.54</td>
<td>0.920</td>
<td>7</td>
</tr>
<tr>
<td>Timely supply of material</td>
<td>3.54</td>
<td>0.980</td>
<td>7</td>
</tr>
<tr>
<td>Appointment of highly experienced technical consultant</td>
<td>3.54</td>
<td>0.885</td>
<td>7</td>
</tr>
<tr>
<td>Reliable pre-contract estimates</td>
<td>3.52</td>
<td>0.955</td>
<td>8</td>
</tr>
<tr>
<td>Completed design at the time of tender</td>
<td>3.50</td>
<td>0.829</td>
<td>9</td>
</tr>
<tr>
<td>Use of up-to-date technology</td>
<td>3.49</td>
<td>0.989</td>
<td>10</td>
</tr>
<tr>
<td>Appointment of experienced contractor</td>
<td>3.49</td>
<td>0.912</td>
<td>10</td>
</tr>
<tr>
<td>Comprehensive client brief development</td>
<td>3.49</td>
<td>0.912</td>
<td>10</td>
</tr>
<tr>
<td>Allocation of adequate project duration</td>
<td>3.48</td>
<td>0.858</td>
<td>11</td>
</tr>
<tr>
<td>ADEquate planning</td>
<td>3.46</td>
<td>0.980</td>
<td>12</td>
</tr>
<tr>
<td>Good workmanship</td>
<td>3.44</td>
<td>0.954</td>
<td>13</td>
</tr>
<tr>
<td>Adequate designs</td>
<td>3.42</td>
<td>0.993</td>
<td>14</td>
</tr>
</tbody>
</table>

SD = standard deviation; MS = means score; R = rank

### 6.3 CONCLUSION

This chapter gives the analysis of the data which was collected throughout a well-structured questionnaire designed by the researcher. As a fieldworker, the questionnaires were sent to the chosen respondents (architect, engineers, construction managers, construction project managers, quantity surveyors and others) for facilitation in the Kinshasa province, Democratic Republic of Congo.

The data analysis and the discussions found were made with the STATKOM. Further results were presented graphically, tabled and with figures. On the upcoming chapter, the focus will be on be the discussion of findings that were collected from the survey results (data analysis) and to give the relationship with the research questions. Objectives presented in chapter one of the study will be contrasted with findings and therefore conclude whether they were hypothesized correctly or not.
7 CHAPTER SEVEN: DISCUSSIONS OF FINDINGS AND RECOMMENDATIONS

7.1 INTRODUCTION

This chapter elaborates a discussion in which the results of the research regarding an evaluation of the assessment of environmental impact of building construction activities in Kinshasa for the performances that have to be regulated by the process of the construction activities and the implementation of the EIA. The results of the findings are discussed in relation to the literature covered in Chapter Two, Three, Four and Five to ascertain whether the objectives of the research have been matched from the finding analysis conducted on Chapter Six. Discussion of findings in this chapter related to the questionnaires contributed to the study that formed an integral part of the relevant data.

7.2 BACKGROUND INFORMATION

On this part of the research, the study presented a discussion of the data extracted regarding the respondents’ background information with all their details as follows: gender, age group, ethnicity, professional occupation, years of experience, qualification and the sector in which they currently work for.

7.3 BACKGROUND INFORMATION RESULTS

The findings of the 134 valid questionnaires showed that 70.7% of the respondents were male and 29.3% were female. Figure 6.1 related to the gender of the respondent.
The sub-question related to the age group. 7.6% of the respondents were in the age group of 21-25 years old, 15.2% of the respondents were in the group age of 26-30 years old, 27.3% of the respondents were in the group age of 31-35 years old, 17.4% of the respondents were in the group age of 36-40 years old, 6.8% of the respondents were in the group age of 41-45 years old, 6.1% of the respondents were in the age group of 46-50 years old, 12.9% of the respondents were in the age group of 51-55 years old and the last group which is 6.8% were in the age group of 56 and above. Figure 6.2 related to the respondent's ages.

The ethnicity of the respondents was ranked as follows: 69.9% African, 7.5% White, 18.8% colored and the 3.8% left was estimated as either Indian or Asian. Figure 6.3 related to the respondent's ethnicity.

The findings related to respondents’ professional qualification illustrated on Figure 6.4 results showed that 26.5% were architects, 13.6% were quantity surveyors, 32.6% civil engineers, 12.1% project managers, and the construction managers were 15.2%.

Figure 6.5 shows the working experience of the respondents in the industry. It was rated as follows:

The result have demonstrate that male were most involved then woman, the age of those who are actually working on the field is limited in between 21 to 35 years old. African people are predominate of cause i
s in Africa and white are lightly following them because of the ownerships of many companies, further the survey shows that civil engineers are more involved followed by architects and there comes constructor managers and quantity survey.

Figure 6.6 shows the highest qualification the respondents obtained. It shows that 1.5% of the respondents had certificate diploma, 41.4% of the respondents had a national diploma, 36.8% of the respondents had bachelor’s degree, 15.0% of the respondents had master’s degree and 5.3% of the respondents had a doctorate. Almost all questionnaires that were put aside provided 40% of the information asked.

Figure 6.7 illustrates the current sector in which respondents are working for; 54.8% of the respondents work for the private sector and 45.2% work for the public sector.

Figure 6.8 gives us the number of the projects the respondents are currently working on. 12.5% of the respondents had 0 projects, 13.3% of the respondents had 1 project, 26.7% of the respondents had 2 projects, 20.0% of the respondents had 3 projects, 20.0 of the respondents had 4 projects, 3.3% of the respondents had 5 projects, 2.5% of the respondents had 6 projects, and 1.7% of the respondents had 9 projects.

7.4 RESEARCH QUESTION ONE

What are the negative impacts of building construction activities on the environment?
7.4.1 INTRODUCTION

The ranking (R) of the negative impacts of construction on the environment were calculated using the mean score (MS) and the standard deviation (SD), in accordance with the environmental impact assessment. It was divided into two branches A: extent to which your company contributes to negative impacts, B: level of concern about impacts on negative environmental impacts.

7.4.2 EXTENT TO WHICH YOUR COMPANY CONTRIBUTED TO NEGATIVE IMPACTS

The study revealed the following company contributions to negative impacts and the extent thereof. Below are the results of the findings:

That, from the extend on which company contribute to the study land with are result of dust generation with machinery and air pollution on the same means score as well as standard deviation followed by land pollution, generation of inert waste at the last position the survey shows that disturbance of the temperature, landscape alteration and natural disaster, radiation exposure and chemical pollution does not have a significant impacts on the construction process.
7.4.3 LEVEL OF COMPANY CONCERN ABOUT NEGATIVE IMPACTS TO ENVIRONMENT

The study reveals the following findings from the level of concern from various companies about impacts on negative impact on environment, at this stage it is acceptable for the spread of undesirable diseases, waste generation, air pollution and disturbance of the temperature to be gradually descending with significant means score and standards deviation last not least, the soil erosion, radiation exposure, chemical pollution and natural disaster have impacts that does not after significantly which means it is a negative impact with less impacts, after the study conducted improvement might be implement in the republic with the help of professional bodies.

7.4.4 FINDINGS

The findings of this study proposed that a conceptual framework for an assessment of environmental negative impacts of construction activities should be outlined, with Furthermore, the study outlined that the general preliminary research results have shown that the companies that hire construction services on a normal basis do not implement some exigencies, has recurred on EIA articles published for their projects which have landed on negative impacting consequences in their executions (Wolbers,2011; Howard and Serpell,2012).
The damaging lack of material benefits considered to be basic necessities in a society already mentioned (habitations, habitats and all surrounding of construction sites) have an impact on the construction projects. Presented as shown on the figure one and two from dust generation with construction machinery; air pollution; land pollution; generation of inert waste, waste generation, noise pollution; soil erosion; the spread of undesirable diseases and water pollution. They are classified with a high rate of negative impact on the environmental daily performance of the construction as revealed on the research of knowledge managed by architect engineers and the construction industry. Every innovation in the construction follows the Formation, Process, Management 2(1), 53-67 reviews by Kartam (2001).

Followed by the disturbance of the temperature; landscape alteration; natural disaster; radiation exposure; chemical pollution which comes on the second position with an acceptable rate of impacts, the reaching of critical toxicity might be an event that results from years of accumulation, the elimination or mobile action to drink water from geological deposits (WHO, 2010a).

Natural interference on the construction sites may advocate a heavy contamination. Few studies were conducted on the mixtures of chemical and soils. People who live near a construction site are significantly impacted by the activities on the site under construction (Burgess, 2013). The implementation of a better understanding, a follow-up and a good training process might bring an improvement on the environmental impact, as
well as the process that has an impact on it, to build up a framework requirement which might be legalized to give fast compliance.

The study findings of research made by authors show that since companies focus on maximizing income (profits) and gaining competitive advantage, the environmental impacts caused due to their activities might not be a priority and as a result neglect the negative impacts to the environment (UCB-ITS-VWP-2006-4).

Furthermore the research of the (UCB-ITS-VWP-2006-4) provides a clear idea on which we may relay to the society intended to present a means of meeting the economic, environmental and social basis efficiently as well as equitable, at the same time escape reduced or unwanted adverse impacts that are the same as their related costs during procedure space and limitation of time. Some of the factors listed below are more likely to be related to the companies or respondents' responses. Some of the responses are:

- The spread of undesirable diseases
- Waste generation
- Air pollution
- Disturbance of the temperature
- Water pollution, dust generation with construction machinery, generation of inert waste, noise pollution, Land pollution was ranked, landscape alteration, soil erosion was ranked, radiation exposure, chemical pollution, natural disaster looking some of the results it can
be seen that some of the numbered factors are more likely to be related to the companies or respondents’

7.5 RESEARCH QUESTION NUMBER TWO

What are the causes of poor construction activities that affect the environment?

7.5.1 INTRODUCTION

The complex nature of project-related factors in the company (with the attention focused on general impacts of the construction on the environment) are divided into different categories, which are: contractor, consultant, material, labors, and external factors. The finding related to the current research question is thus introduced as follows.

**General contractors related**

Based on the mean score (MS), standard deviation (SD) and the ranking (R) for list of the measurement of construction related issues by looking at the level of importance, linked on each part that might affect the success of a project. The issues are presented below:

Frequent change of sub-contractors is the first to be listed that makes him undesirable, poor execution improper statements interpretation and poor quality of the contractor staff the three up listed are as well in desirable with different means score and standard
deviation, the site mobilization and rework due to errors during construction are on the bottom with impacts.

**General consultant-related**

Based on the mean score (MS), standard deviation (SD) and the ranking (R) of the list of the consultant-related, the results are depicted below:

Starting with, Mistakes and inconsistencies in design documents, insufficient data collection and survey before design, are ranked as the likely to cause undesirable impacts for the activities of the construction in its process. In the second place, Unclear and inadequate details in drawings, Poor coordination, were ranked with causes that are acceptable. To conclude, Lack of experience, Delay in approving major changes in the scope of work come at the last position.

**General materials-related**

Based on the mean score (MS), standard deviation (SD) and the ranking (R) from the list general material-related, the following applies:

At the first position of the finding are the couple of causes link to poor construction activities, ordering wrong material, Delivery of wrong material, Delay in material delivery. On the second position the result makes a landing on, Shortage of equipment, Lateness on material ordering, Inappropriate material storage on the third and last position the
Damage of stored material while needed urgently, Change of material types during construction, Equipment breakdowns, looking at the result the conclusion from the findings can be that little effort have to be implemented to give a good result for the future infrastructure.

**General labour-related**

Based on the mean score (MS), standard deviation (SD) and raking (R) from the list of, general labor-related: position, the results follow:

Actually this might be considered with more delicateness, firstly Inexperience of workers, secondly Laziness in executions, thirdly Lack of communication among workers, fourthly Low productivity level of works and on the last position Shortage of labour. this result from the study are very capital and necessaire for future improvement.

**External factors**

Based on the mean score (MS), standard deviation (SD) and ranking (R) from the list of external factors, the following results were found:

Study result are namely cited as followed, Change in government, Natural disasters, traffic control and restriction on sites Change in economic factors, and on the following cause are Delay in providing services from utilities Effects of subsurface and ground conditions position, obtaining permits from municipality, Delay in performing final
inspection and certification, respondents gave response which leads to the listed up issues according to the causes implication.

7.5.2 FINDINS

The findings frequent between the alteration of sub-contractors, poor execution, and improper statements interpretation, poor qualification of the constructor’s staff, site mobilization, and the rework due to errors during construction. When the project is conducted under contract the scope of the proper project has to be carefully coordinated according to the elaborated project process, and its achievement has to be controlled progressively elaborate during the execution of any construction (Abdoul-rahma, H; Berawi, M et al 2006).

The results of the findings show that a consultant can serve the client by development assistance of a new project by presenting a workshop that is going to lay down the design quality of the product, and the severity of impacts of mistakes and inconsistencies in design documents, amongst other things. In accordance with the findings of the work, the results bring to our attention the full scope of the consultant and their responsibilities thereof, with particular attention to EIA measures.

The findings from the survey supported the idea of Bhirud and Revatkar (2016) who said environmental impact assessment programs in the construction companies which keep a proper project achievement regulation while at the same time being cognizant of
making a simple way to reduce implementation of design changes; costs; quality conformance on an acceptable basis.

Furthermore, it was supported by Khalid al Marri (2014) that the follow up on different complications met during the progress of the project, the direction of decisions made and resource management of the company and the same study, upon further reading, shed some light about the recognition of benefits (interrupt operations costs and feedback on the ongoing project in real time). Improvement of tolerance, reducing cost in the executions, ensuring transparency in information circulation and accuracy, contribute towards ensuring the frameworks and legal requirements are complied with, and on time. On this study made, the previous statements have to be implemented in order to regulate little alignment, as Fun at al. (2007) said.

7.6 RESEARCH QUESTION NUMBER THREE

What are the ways to mitigate the impacts of the building construction activities on the environment?

7.6.1 INTRODUCTION

Based on the nature of design-related factors in the company, with particular attention made towards causes of poor construction activities, these factors are categorized as; design factors, handling factors, worker factors, management factors, site condition
factors, procurement factors, external factors. The findings related to the current research question are thus developed as follows.

**Design factors**

Based on the mean score (MS) standard deviation (SD) and ranking (R) from the list of design factors: wrong compilation of designs (MS = 3.27, SD = 0.818, R = 1), poor design quality (MS = 3.16, SD = 0.714, R = 2), inexperienced designer (MS = 3.13, SD = 0.765, R = 3), design errors (MS = 3.10, SD = 0.863, R = 4), frequent design changes (MS = 3.06, SD = 0.725, R = 5).

**Handling factors**

Based on the mean score (MS), standard deviation (SD) and ranking (R) form the list handling factors: poor material handling (MS = 3.37, SD = 0.746, R = 1), poor quality of materials (MS = 3.34, SD = 0.763, R = 2), wrong material storage (MS = 3.31, SD = 0.817, R = 3), equipment failure (breakdown) (MS = 3.25, SD = 0.726, R = 4), tools not suitable (MS = 3.22, SD = 0.717, R = 5).

**Worker factors**

Based on the mean score (MS), standard deviation (SD), and ranking (R) from the list worker factors: a lot of overtime for worker (MS = 3.39, SD = 0.776, R = 1), poor
understanding of environmental assessment (MS = 3.29, SD = 0.744, R = 2), shortage of skilled workers (MS = 3.26, SD = 0.835, R = 3), poor communication between workers (MS = 3.25, SD = 0.860, R = 4), Workers’ mistakes (MS = 3.22, SD = 0.752, R = 5) and lack of experience (MS = 3.20, SD = 0.807, R = 5).

Management factors

Based on the mean score (MS), standard deviation (SD) and ranking (R) from the list of management factors: Lack of coordination among parties (MS = 3.38, SD = 0.711, R = 1), poor supervision (MS = 3.32, SD = 0.763, R = 2), lack of environmental awareness (MS = 3.27, SD = 0.808, R = 3), non-availability of equipment (MS = 3.26, SD = 0.786, R = 4) and poor planning (MS = 3.25, SD = 0.887, R = 5),

Site coordination factors

Based on the mean score (MS), standard deviation (SD) and ranking (R) from the list of site coordination factors: Crew interference (MS = 3.31, SD = 0.795, R = 1), congestion of the site (MS = 3.24, SD = 0.840, R = 2), waste pile over time (MS = 3.20, SD = 0.779, R = 3), poor site condition (MS = 3.18, SD = 0.855, R = 4), light problem (MS = 3.17, SD = 0.833, R = 5) and leftover material (MS = 3.14, SD = 0.762, R = 6).
**Procurement factors**

Based on the mean score (MS), standard deviation (SD) and ranking (R) from the list of procumbent factors: Shipment errors (MS = 3.38, SD = 0.779, R = 1), ignorance of specifications (MS = 3.31, SD = 0.775, R = 2), waiting for replacement (MS = 3.22, SD = 0.797, R = 3), ordering errors (MS = 3.18, SD = 0.779, R = 4) and mistakes in quantity surveys (MS = 3.13, SD = 0.788, R = 5)

**External factors**

Based on the mean score (MS), standard deviation (SD) and ranking (R) from the list of external factors: Lack of law enforcement (MS = 3.50, SD = 0.966, R = 1), unpredictable socioeconomic conditions (MS = 3.48, SD = 0.942, R = 2), on the third position weather conditions (MS = 3.45, SD = 0.898, R = 3), followed by accidents (MS = 3.35, SD = 0.898, R = 4), pilferage (MS = 3.32, SD = 0.932, R = 5) and vandalism (MS = 3.21, SD = 0.938, R = 6).

**7.6.2 FINDINGS**

Many factors might be related to retardation of any project and compare reasons of the retard has to be a valuable transaction for the improvement of misunderstanding or claims. Almost all retard claims are complex and whereas researchers insist on the cost
that is high and the linked related risk to litigated retard on the reclamations, not many insist on the responsibility to the delay of project, Schumacher (1996).

The construction sector over the few past years has not improved significantly; lack of technologies across the construction interchanges supply is the first main issue in the industry. The inconsistency of performance is so evident in the Republic Democratic of Congo construction projects on one side international firms and on the other local construction contractors. The growing trend of this inconsistency results in factors such as; wrong compilation of designs, poor design quality, inexperienced designer, design errors, frequent design changes.

Normally, studies present various factors in eleven groups as follows: consultant related, contractor related, design related, externality related, labor-related, material related, owner related, project related, engineer related and human behavior related, Gunduz, M., Nielsen.,Y and Ozdemir, M.,(2013) and Hemanta,D., Anil, S., Iyer, K. and Sameer, R(2012).

This study has rated the factors into seven categories namely; design, handling, workers, management, site condition, procurement and external. This helps in the study conducted to present a survey and make a clear result for this case, supported by the study of Zakeri et al (1996). The survey made in Ariana gives a high ranked list of material
shortage; water and site condition; equipment breakdown; drawing deficiency/changes orders; lack of proper tools and equipment.

This was followed by the study made by Malaysia by Kadir et al (2005) which presents a ranges of factors which are; adverse construction labor, productivity at a project level influenced by material hostage on site, non-payment of suppliers causing delays on material delivery Kakulsawatudom and Emsley (2001) conducted a survey that landed on the result which shows eight factors that have the most effects on construction productivity: lack of material, lack of tools, and lack of equipment, incomplete drawings, overcrowding, poor site conditions, tools/equipment breakdown, incomplete supervisor and rework.

Dai et al (2007), the study is going to bring measured impacts in which supervisor might direct: communication; safety; tools; and consumption. The process maybe including materials engineering drawing management; project management and the construction equipment

7.7 RESEARCH QUESTION NUMBER FOUR

What are the barriers faced by the construction in achieving successful project outcomes?
7.7.1 INTRODUCTION

According to the mean score (MS), standard deviation (SD) and the ranking (R) from the construction companies in mitigating the impacts of construction on the environment, the following are barriers that impact the environment, listed in three groups: rising costs, time and quality. The finding related to the current research question is thus developed as followed.

➢ Rising costs

Based on the mean score (MS), standard deviation (SD) and ranking (R) from the list of rising costs:

On a normal basis money inflation is the main power for the achievement of the construction even if the poor quality equipment due to lake upgrade and lake of materials that have cause long time delay and increase in wage and the rank of the product is as followed on the listed above.

➢ Time

Based on the mean score (MS), standard deviation (SD) and the ranking (R) from the list of time:
Definitely, most of the change that accounted might be due starting with slow delivery of materials and supplies. in the second place delay in the construction schedule. Moreover, government restraints to conclude with, delay in the design schedule. Most this might be study and improved with quiet less effort and the implication of the professional bodies.

➢ Quality

Based on the mean score (SD), standard deviation (SD) and ranking (R) from the list of quality:

The lack of finance is always the case in connivance with availability of materials, lack of skilled workers, poor quality supervision and there comes the inspection and poor design criteria, this result from the survey prove that main problems are not really irreversible. it might come to an end with less contribution and more implications.

7.7.2 FINDINGS

Mbachu and Nkado (2004) reveal that the rising costs indeed have involvement for the main stakeholders, in particular, inflation, poor quality equipment, lack of materials, long time delay and increase in wage. On the same note, Elinwa and Silas (1992) show that in Nigeria a similar study was conducted which identified thirty-one factors that had
caused an exorbitant cost of the buildings that were because of illegal practices and kickbacks valuable factor in the country.

Furthermore the study of Frinmpong, Oluwolye and Crawford (2003) suggest that Ghana, which is a developing country, identified a number of factors that delay cost overruns of the construction projects linked to time: Changes, slow delivery of materials and supplies, delay in the construction schedule, government restraints, and delay in the design schedule. Whereas Kangari, (1989) stated that in the United States of America there are ten factors that are major adjuvants of the failed business and construction cost-related factors, which were gradually influenced the failures related to quality: Lack of finance, availability of materials, lack of skilled workers, poor quality supervision, inspection, poor design criteria. Studies presented by the following researcher have contributed to the finding lists that cover rising costs, time and quality (AL-Khabi, 1990; Elinwa and Sila, 1993; Aibinu and Jagboro, 2002; Omoreigie and Radford, 2005),

There are some studies that reveal the reason why many researchers found different results according to the condition of the countries in which the research was conducted - some of them are developed and some of them are developing countries. The government implication in the economy at different departments of the environmental and construction fields has a couple of serious links on the decisions made. In the very same field, researchers show that improvement might be achieved on certain aspects such as listed:
Time and cost aspect, Reliability of project (this can be changed through making, decisions quickly), Quick response to of material supply, Accessibility to resources, Detailed drawing of the construction with all is conformities, Easy and fair communication, Effective management of the site, The schedule and planning have to be well made

7.8 RESEARCH QUESTION NUMBER FIVE

What are the measures that can be taken to minimize the environmental impacts of building construction activities?

7.8.1 INTRODUCTION

The calculation of the mean score (MS) standard deviation (SD) and ranking (R) through the implementation of measures to regulate building construction activities on the environment focus on the measures to regulate construction activities categorized as follows:

Mean score (MS) standard deviation (SD) and ranking (R) link with the measures to regulate construction activities categorized as follow:

- use of appropriate construction methods, proper pre contract planning, employment of experienced, adequate pre contract project coordination ordering the right materials, proper project implementation and management, appointment of highly experienced committed design team, implementation of local regulation, decrease variation of order,
time supply of materials, appointment of high experienced technical consultant, reliability pre contract estimations, completed design at the time, use of up-to-date technology, appointment of experienced contractors, comprehensive client brief development allocation of adequate project duration, adequate planning good workmanships, adequate designs.

All of this cited factors are contributing to what extent to a change from what is actually going on to something more repayable, for a sustainable future in the construction companies and long life expectation.

7.8.2 FINDINGS

There are several ways in which the study might contribute to the construction industry in the countries. The application of value engineering concept, which focuses on the meticulous analysis of each office, can be used to implement processes in place to curb negative effects

The office requirements have to look at negative impacts that affect projects, as well as to reduce and change,: on one hand, the making of investigation on construction method used, materials availability, costs verification, on the market, procurement, similarity, benefits and cost, proper planning and organization. On, the other hand, it is important to provide clear easy free designs and details to not fall in the misinterpretation of the case with some missing clues, the corps that receive the documents might
implement it as provided (Fisk, 1997). On the same open view Cook and Williams (2003), proposed diminution of cost measures, the elimination or reduction of design/specification, achievement and site waste by the creation and enforcement of policy and management of the materials.

The establishment of firm’s requirements and features of the project at the very beginning stage, building up the mind of every worker by motivating them with a signing of an agreement that certifies their capabilities to deliver demands and attach them to the deontological requirement. To staying on the right move, keeping the project contract clauses without any changes once the project has started, the human resource management encouragement and follow-up that might bring some correction on the wrong progress helping in good accomplishments, from the study of the land and the different implementation of the building in general on different types of build. A model has to be set up or built, to follow and to link every project to the required function.

However, closer supervision is a requirement for proper execution of works. Rework has to be avoided so that the project will not be delayed and become more expensive than initially budgeted for. The wanted result might be achieved when a proper monitoring of values and factors are put into practice. Therefore it becomes critical for the performance of the construction industry to make easy strategic decisions for the prevailing of successful project achievement. Many of the factors such as delays, cost overruns, and illegal decisions, remains unsolved since 2000.
A solution to this conundrum is the creation of a monitoring and evaluation process that will effectively monitor projects from inception until close-out.

Unfortunately, the evaluation and monitoring have been reduced with quite a big number of barriers for their realization on the sited area or regions such as diverse nature of the project and opposite views on the ongoing projects. The technology used in delivering of projects is poor. It is hoped that this study will provide a way for a more streamlined operation for proper delivery of qualitative and economic construction projects on the recommended time set.

The capacity of the building is closely connected, not only direct adjustment of poor exercises but also for the implication based on many results and analysis; therefore there is a need for synergy with other activities on construction project system which have to escape weak budgeting and planning. Data found on the research made will pave a way for processes to be followed and how these should be sensibly monitored so that problems of such a nature are curbed or eliminated entirely.

7.9 IMPLEMENTATION OF FINDINGS

There are several ways in which the study might contribute to the construction industry in the countries. The application of value engineering concept, which focuses on the meticulous analysis of each office, can be used to implement processes in place to curb negative effects
The office requirement have to look at negative impacts that affect projects as well as to reduce and change: on one hand the making of investigation on construction method used, materials availability, costs verification, on the market, procurement, similarity, benefits and cost, proper planning and organization, on the other hand to provide clear easy free designs and details to not fall in the misinterpretation case with some missing clues, the corps that is going to receive the documents understand as it is provided (Fisk, 1997). On the same open view Cook and Williams (2003), proposed diminution of cost measures, the elimination or reduction of design/specification, achievement and site waste by the creation and enforcement of policy and management of the materials.

The establishment of firm’s requirements and features of the project at the very beginning stage, building up the mind of every worker by motivating them with a signing of an agreement that certifies their capabilities to deliver demands and attach them to the deontological requirement. To staying on the right move, keeping the project contract clauses without any changes once the project has started, the human resource management encouragement and follow-up that might bring some correction on the wrong progress helping in good accomplishments, from the study of the land and the different implementation of the building in general on different types of build. A model has to be set up or built, to follow and to link every project to the required function.

However, closer supervision is a requirement for proper execution of works. Rework has to be avoided so that the project will not be delayed and become more expensive
than initially budgeted for. The wanted result might be achieved when a proper monitoring of values and factors are put into practice. Therefore it becomes critical for the performance of the construction industry to make easy strategic decisions for the prevailing of successful project achievement. Many of the factors such as delays, cost overruns, and illegal decisions, remains unsolved since 2000.

A solution to this conundrum is the creation of a monitoring and evaluation process that will effectively monitor projects from inception until close-out.

Unfortunately, the evaluation and monitoring have been reduced with quite a big number of barriers for their realization on the sited area or regions such as diverse nature of the project and opposite views on the ongoing projects. The technology used in delivering of projects is poor. It is hoped that this study will provide a way for a more streamlined operation for proper delivery of qualitative and economic construction projects on the recommended time set.

The capacity of the building is closely connected, not only direct adjustment of poor exercises but also for the implication based on many results and analysis; therefore there is a need for synergy with other activities on construction project system which have to escape weak budgeting and planning. Data found on the research made will pave a way for processes to be followed and how these should be sensibly monitored so that problems of such a nature are curbed or eliminated entirely.
This study gives the respondents feedback regarding different views, disapproving comments, success factors, gains, and clues for the performance of the construction goals in establishing a proper environmental impacts assessment (EIA) system. The study delivers data analysis and discussions along with significant improvement in construction projects, resulting in the findings almost satisfying the question of the study.

The conclusion of the chapter that follows will unpack recommendations of the research presented and discussed in accordance with the projects of the study.
8.1 INTRODUCTION

The current work was conducted in the field of the construction, with the principal aim to make an assessment of environmental impacts of building construction activities: the case of our study Kinshasa, Democratic Republic of Congo. In this chapter, the conclusions and recommendations of the research study are presented and discussed in connection with the objectives of the study. In order to achieve this reason, the particular targets of the study were:

To reconsider some of the researchers in regards to negative impacts of the construction; outline a conceptual framework for an assessment of environmental negative impacts of construction activities;

To provide a comprehensive review of major causes typically found in poor construction projects and present the ways to deal with them in the future;

To mitigate the unnecessary construction impacts that can be due to incompetent planning and to control constraints of the pre-condition for the building construction process;

To determine the barriers faced by the construction companies in achieving successful outcomes;
To present some of the measures that could be taken to give a regulation that would be implemented during the whole process for the construction activities of projects;

Below the researcher unpacks the answers for study given (as per the first chapter).

8.1.1 RESEARCH OBJECTIVE 1

The first research objective was to reconsider some of the researchers in regards to negative impacts of construction; outline a conceptual framework for an assessment of environmental negative impacts of construction activities;

The literature shows the level of concern and extent to which company contributes to the major impacts of construction activities on the environment: dust generation with construction machinery, air pollution, land pollution, generation of inert waste, waste generation, noise pollution, soil erosion, spread of undesirable diseases, water pollution, disturbance of the temperature, landscape alteration, natural disaster, radiation exposure and chemical pollution.

Findings from the questionnaire survey results obtained from the respondents showed that the dust generation, air pollution, land pollution, generation of inert waste, waste generation, noise pollution, soil erosion, spread of undesirable diseases, water pollution and the disturbance of the temperature this eleven factors were found as the main issue that causes negative impacts on the environment the Kinshasa, the Democratic Republic
of Congo from the survey made. Hence the research objective was reached in the literature related and the questionnaire.

8.1.2 RESEARCH OBJECTIVE 2

The second objective of the study pursued was to provide a comprehensive review of major causes typically found in poor construction projects and present the ways to deal with them in the future.

The literature gave different factors that might be related to the construction of negative impacts on the environment: contractor related, consultant related, material related, labors related and external factors. Further, in the literature, it was discovered that the categories of factors such as demolition and clearing of site preparation demolition and every loose material, clearing of the site preparation for a new project, containing technical equipment, scope of the main physical work include the total manufacturing process, transport and delivery to the site, the installation, the execution, completion, testing and handing over of the works being, mechanical installation, this is factors are the principal factors that were numbered in the literature review.

From the survey result findings from the respondents, the questionnaire confirmed the factors that have a negative impact on the environment. Factors such as: frequent change of sub-contractors, poor execution, improper statements interpretation, Mistakes and inconsistencies in design documents, insufficient data collection and survey before
design, unclear and inadequate details in drawings, ordering wrong material, delivery of wrong material, delay in material delivery, position Inexperience of workers, laziness in executions, lacks of communication among workers, Change in government, natural disasters, traffic control and restriction on sites are part of the factors that are causing negative impacts on the environment, therefore, it might clear that the research objective was reached when looking at the questionnaire survey findings.

8.1.3 RESEARCH OBJECTIVE 3

This third objective of the study was to mitigate the unnecessary construction impacts that can be due to incompetent planning and to control constraints of the pre-condition for the building construction process in Kinshasa, Republic Democratic of Congo.

The literature on the mitigation of the construction activities and negative impacts on the environment highlighted measures that can be used to mitigate the negative impact on the environment. Some of the measures are the use of new and defect-free equipment, sprinkling the site with water, visual control of cars and vehicles, washing the tires, transport of waste from the regional waste company, reuse of soil removed, separation of waste from building material and organizing a proper storage, construction of ditching channels, sprinkling the construction site water, usage of damage and new free machinery, controlled water usage, using damage and new equipment, transportation of
waste must be done by licensed waste companies, safety procedures and hazardous waste treat have to regulate an administrate which to name but a few.

Findings from the survey questionnaire show that construction project mitigation of negative impacts such as: wrong compilation of designs, poor design quality, inexperienced designer, Poor material handling, poor quality of materials, wrong material storage, A lot of overtime for worker, poor understanding of environmental assessment, shortage of skilled workers, Lack of coordination among parties, poor supervision, lack of environmental awareness, Crew interference, congestion of the site, waste pile over time, Shipment errors, ignorance of specifications, waiting for replacement, Lack of law enforcement, unpredictable socioeconomic conditions, on the third position weather conditions, to name but a few, are measures that could be prevented, with careful planning and conscientiousness. The objective of the study was met, as well as in the literature and from the survey conducted.

8.1.4 RESEARCH OBJECTIVE 4

The fourth research objective was to determine the barriers faced by the construction companies in achieving successful outcomes in construction projects and environmental impact assessment in the Kinshasa, Democratic Republic of Congo.

The literature has located three grouped factors among a variety which were listed as follows: rising costs, time and quality.
Findings from the survey of the questionnaire from the respondents gives: inflation, poor quality equipment, lack of materials, long time delay, increase in wage, changes, slow delivery of materials and supplies, delay in the construction schedule, government restraints, delay in the design schedule, lack of finance, availability of materials, lack of skilled workers, poor quality supervision, inspection and poor design criteria as ranked barriers faced in mitigating the construction activities and their activities in Kinshasa, therefore the achievement of the objective was reached.

8.1.5 RESEARCH OBJECTIVE 5

The last objective of the study was to present some of the measures that could be taken to give a regulation that would be implemented during the whole process for the construction activities of projects in Kinshasa, D.R.Congo.

The study conducted shows that some require having to direct process achievement, and arrangements might be made for the satisfaction of both parties. Upon the realization of the achievement of the money, suppliers are co-operative and responsive, more professional and objective debates over change as well as issues that might be had. Interestingly, the study shows that critical success factors such as critical success factors impact the performance deliverable of projects. sensitive analysis, controlling or avoiding the risk, impacts of product lifecycle including disposal and obsolescence’s time and/or
ordering resources, delivery capacity, performance method, description of functional
equipment, benefits released

Furthermore, the research has proved that most of the construction activities such as;
use of appropriate construction methods, proper pre-contract planning and employment
of experienced professionals, adequate pre-contract project coordination, ordering the
right materials, proper project implementation and management, appointment of highly
experienced committed design team, implementation of local regulation, decrease
variation of order, time supply of materials, appointment of highly experienced technical
consultant both literature review and research conducted have achieved the goal
perhaps the level of gravity is highly different but still the findings linked with the research.

8.2 GENERAL RESEARCH CONCLUSION

The literature review delved into a number of factors that have negative impacts on the
environment amid construction activities of any project. The similarities between the
literature and the current study were so close. The literature review presented negative
impacts of the construction activities on the environment. These were discovered by
different groups, some of which are caused by contractor or consultant and those that are
causd by other external factors.

The literature reveals that every division of the construction activities amid a project
has varieties of factors that might be conducive to negative impacts on the environment.
The research assessed negative impacts of the construction activities on the environment from the few varieties identified and compiled from an expended literature review. Results from the research supported journals, reviews, and articles done by previous researchers highlight that not only one factor might be responsible for environmental impacts.

Furthermore, findings show that there are negative impacts that come from a natural environmental course and yet others from the movements and transformations in Kinshasa, D.R.Congo. However, the measures that can be taken to assess negative impacts have to be remote by construction professionals to spare or in the end mitigate negative impacts of construction activities on the environment. Concerns with the research results found causes, barriers faced to mitigate and measures to regulate the negative impacts of construction activities on the environment in Kinshasa, D.R.Congo. Therefore, the findings presented in this research abet to the carcass of knowledge and give considerable suggestions on running the companies of construction during the project executions, thereby reducing negative impacts and their causes on the environment.

8.3 RECOMMENDATIONS

The construction environment is a high-pressure environment that is highly demanding. The successful execution of construction projects depends heavily on
collaboration and adherence to guidelines that will mitigate any negative impacts that might affect the environment.

Sustainability in the construction industry has demonstrated its value and the power it holds when infused with the right kind of factors that will enhance it. As a recommendation, as far as sustainability is concerned, an up-to-date framework that details sustainability measures must be put in place and exercised in the execution of projects. Not only have a framework but also maintain sustainability mobility and livability.

First of all, it has to be suggested that all individuals from development groups ought to be prepared and taught on the variables that bring negative impacts on the environment with a specific end goal to limit them. Secondly, it is likewise suggested that successive organization of the different elements of complex site construction activities gatherings ought to be held, keeping in mind the end goal to signal conceivable impacts and to deal with them. Thirdly, if an organization is thinking about the execution of new technologies, the improvement of change management strategies will be fundamental and this ought to likewise be consolidated with extensive instruction and preparing to factor the view of technology’s usefulness among employers as well as employees.

Fourthly, however, keeping in mind the end goal to build up an execution based building direction which is essential for decreasing the negative impacts of construction,
it is basic that the construction company has institutionalized climatic information (data) and methodology for performance prediction.

However, devices should be fitting and assess future climate factors. There will likewise be a requirement for better scale spatial and fleeting situation data with improved local and neighborhood environmental change situations, and scaling for climate zone data and in fifty positions having a look at environmental issues, for example, disintegration and strong waste contamination torment the urban areas of the DRC. Besides mining and logging, the improvement of natural resources based enterprises has been seriously embarrassed by many years of botch and struggle.

Strategies concerning access to and control over nature’s resources are out of date and uncertain. Infringement into national stops and secured regions and devastation of their foundation has turned into a genuine neighborhood and national issue. The common clash has empowered extensive scale deforestation of DRC's tremendous tropical timberlands and normal resources.

Several NGOs are working in the DRC with the goal of reinforcing environment institutional and policy framework. Reinforcing these organizations have enhanced the natural sanitation of Kinshasa for the time being while redesigning the arrangements and laws representing natural resources administration. As previously mentioned, in the past
segment, there were no broad EIA laws in the DRC. In any case, there are stringent natural prerequisites in the Mining Code.

8.4 AREAS FOR FURTHER STUDIES

Further studies are recommended in the following fields:

Further study should be carried out to assess the extent to which project performance can be improved through the implementation of an Environmental Impact Assessment and basic knowledge system in the construction industry.

Further research should be done to establish the key performance indicators of the successful adoption of an AIE system in the D.R.CONGO construction industry.

Further studies and research could be conducted in assessing the impact of organizational culture on the perception of the AIE system in the construction industry.

A study ought to be conducted developing a successful model for the implementation of an AIE system in the construction industry.

A study should be conducted in developing frameworks on how to facilitate collaboration among the clients, design team, and the contractor on one virtual desk through the use of an AIE system in the construction industry.
9 REFERENCES


Ofori, G., 2000, November. Challenges of construction industries in developing countries: Lessons from various countries. In *2nd International Conference on Construction in Developing Countries: Challenges Facing the Construction Industry in Developing Countries, Gaborone, November* (pp. 15-17).


University of Johannesburg

Department of Construction Management and Quantity Surveying

Doornfontein, 2028

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INVITATION FOR RESEARCH SURVEY

We would like to invite you to participate in this research project. Attached to this letter is a short questionnaire and you are invited to complete it. This project is being conducted by the Faculty of Engineering and the Built Environment, Department of Construction Management and Quantity Surveying, University of Johannesburg, South Africa. The research topic is: “AN ASSESSMENT OF ENVIRONMENTAL IMPACT OF BUILDING CONSTRUCTION ACTIVITIES CASE OF KINSHASA D.R.CONGO”. The study is a pre-requisite of the department for the completion of a Masters Technologiae degree course in Construction Management. As part of this research, we need to measure construction activities and their impact on the environment in the province of KINSHASA and also to look at the delivery of the project on time. We would like to assist us to identify the causes, effects, and methods of minimizing impacts of the construction activities on the environment.
To remain anonymous please do not enter your name or contact details on the questionnaire. Information provided by you remains confidential.

Should you wish to know the findings of the research, you are welcome to contact JP MBALA telephonic at +27731658480/+27633116455 or at jpmbala007@gmail.com or C.O Aigbavboa at +27115596398 or at caigbavboa@uj.ac.za. The faculty will gladly send you a summary of the results. By participating in this survey and sharing your experience and knowledge you will help us improve the working environment of the construction sector in KINSHASA.

Thanking you in advance.

MBALA JP
QUESTIONNAIRE ON AN ASSESSMENT OF ENVIRONMENTAL IMPACTS OF CONSTRUCTION ACTIVITIES IN KINSHASA, REPUBLIC DEMOCRATIC OF CONGO

INSTRUCTIONS:

PLEASE ANSWER THE FOLLOWING QUESTIONS BY CROSSING ON THE RELEVANT BLOCK OR WRITING DOWN YOUR ANSWER IN THE SPACE PROVIDED.

Example of how to complete this questionnaire:

Which of the following best describes your professional occupation?

If you are a construction manager you cross number 5

<table>
<thead>
<tr>
<th>Occupation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Architect</td>
<td>1</td>
</tr>
<tr>
<td>Quantity-Surveyor</td>
<td>2</td>
</tr>
<tr>
<td>Civil Engineer</td>
<td>3</td>
</tr>
<tr>
<td>Project Manager</td>
<td>4</td>
</tr>
<tr>
<td>Construction Manager</td>
<td>5</td>
</tr>
</tbody>
</table>
SECTION A: BACKGROUND INFORMATION OF RESPONDENTS

This section discusses the profile of the respondents with regard to their demographic attributes, namely, gender, age group, ethnicity, professional qualification, years of experience, highest qualification, and type of employer.

WHAT IS YOUR GENDER?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
</tr>
</tbody>
</table>

What is your age group?

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 years -25 years</td>
<td>1</td>
</tr>
<tr>
<td>26 years -30 years</td>
<td>2</td>
</tr>
<tr>
<td>31 years -35 years</td>
<td>3</td>
</tr>
<tr>
<td>36 years -40 years</td>
<td>4</td>
</tr>
<tr>
<td>41 years -45 years</td>
<td>5</td>
</tr>
<tr>
<td>46 years -50 years</td>
<td>6</td>
</tr>
<tr>
<td>51 years -55 years</td>
<td>7</td>
</tr>
<tr>
<td>56 years and above</td>
<td>8</td>
</tr>
</tbody>
</table>
What is your ethnicity?

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>African</td>
<td>1</td>
</tr>
<tr>
<td>White</td>
<td>2</td>
</tr>
<tr>
<td>Colored</td>
<td>3</td>
</tr>
<tr>
<td>Indian or Asian</td>
<td>4</td>
</tr>
</tbody>
</table>

Which of the following best describes your professional occupation?

<table>
<thead>
<tr>
<th>Occupation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Architect</td>
<td>1</td>
</tr>
<tr>
<td>Quantity-Surveyor</td>
<td>2</td>
</tr>
<tr>
<td>Civil Engineer</td>
<td>3</td>
</tr>
<tr>
<td>Project Manager</td>
<td>4</td>
</tr>
<tr>
<td>Construction Manager</td>
<td>5</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>6</td>
</tr>
</tbody>
</table>

How many years of experience do you have in the construction industry?

_______ Years
State your highest qualification?

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate Diploma</td>
<td>1</td>
</tr>
<tr>
<td>National Diploma</td>
<td>2</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>3</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>4</td>
</tr>
<tr>
<td>Doctorate</td>
<td>5</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>6</td>
</tr>
</tbody>
</table>

WHICH OF THE FOLLOWING DO YOU CURRENTLY WORK FOR?

<table>
<thead>
<tr>
<th>Sector</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private sector</td>
<td>1</td>
</tr>
<tr>
<td>Public sector</td>
<td>2</td>
</tr>
</tbody>
</table>

State the number of construction projects on which you are currently working?

_____ Projects
SECTION B: NEGATIVE IMPACTS OF CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

This part of the questionnaire explores the negative impacts of construction activities on the environment in Kinshasa, D.R.Congo. Based on your experience using the scale provided to rate the extent to which each is a negative impact.

Below is a list of environment-related outcomes from construction activity. Please indicate the extent to which your company contributes to each outcome through its activities (column A) and indicate the level of concern your company has about the impact the company activities have on each environmental-related outcome (column B).

<table>
<thead>
<tr>
<th>ICAE</th>
<th>Outcome</th>
<th>A: Extent to which your company contributes to...</th>
<th>B: Level of concern about the impact on the environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAE1</td>
<td>Noise pollution</td>
<td>1 2 3 4</td>
<td>1 2 4</td>
</tr>
<tr>
<td>ICAE2</td>
<td>Dust generation with construction machinery</td>
<td>1 2 3 4</td>
<td>1 2 4</td>
</tr>
<tr>
<td>ICAE3</td>
<td>Land pollution</td>
<td>1 2 3 4</td>
<td>1 2 4</td>
</tr>
<tr>
<td>ICAE4</td>
<td>Spread of undesirable diseases</td>
<td>1 2 3 4</td>
<td>1 2 4</td>
</tr>
<tr>
<td>ICAE5</td>
<td>Air pollution</td>
<td>1 2 3 4</td>
<td>1 2 4</td>
</tr>
<tr>
<td>ICAPE</td>
<td>Description</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>6</td>
<td>Disturbance of the temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Generation of inert waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Water pollution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Waste generation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Chemical pollution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Landscape alteration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Natural disaster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Radiation exposure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SECTION C: MEASUREMENT OF CONSTRUCTION RELATED ISSUES**

This section of the questionnaire measures project-related factors in the company.

Below is a list of contractor, consultant, material, labors, external factors which could affect the success of a project. Please indicate the extent to which each problem occurs in your company.
## GENERAL IMPACTS OF THE CONSTRUCTION ON THE ENVIRONMENT

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Often</th>
<th>sometimes</th>
<th>rarely</th>
<th>never</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONTRACTOR-RELATED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEC1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Rework due to errors during construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEC2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Poor execution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEC3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Improper statements interpretation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEC4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Frequent changes of sub-contractors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEC5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Poor qualification of the contractor’s staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEC6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Site mobilization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CONSULTANT-RELATED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECO1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Delay in approving major changes in the scope of work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECO2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Unclear and inadequate details in drawings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECO3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Poor coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECO4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Mistakes and inconsistencies in design documents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECO5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Lack of experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECO6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Insufficient data collection and survey before design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MATERIALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Delay in material delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Lateness in material ordering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Damage of sorted material while needed urgently</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LABORS</strong></td>
<td><strong>EXTERNAL FACTORS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>---------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM4</td>
<td>Changes of material types during construction</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM5</td>
<td>Delivery of wrong material</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM6</td>
<td>Ordering wrong material</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM7</td>
<td>Inappropriate material storage</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM8</td>
<td>Shortage of equipment</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEM9</td>
<td>Equipment breakdowns</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEL1</td>
<td>Low productivity level of workers</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEL2</td>
<td>Inexperience of workers</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEL3</td>
<td>Laziness in executions</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEL5</td>
<td>Shortage of labour</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEL6</td>
<td>Lack of communication among workers</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEEF1</td>
<td>Delay in obtaining permits from municipality</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEEF2</td>
<td>Delay in performing final inspection and certification</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEEF3</td>
<td>Effects of subsurface and ground conditions</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEEF4</td>
<td>Delay in providing services from utilities</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEEF5</td>
<td>Natural disasters</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEEF6</td>
<td>Change in economic factors</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEEF7</td>
<td>Change in government regulation and laws</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION D: MEASUREMENT OF DESIGN-RELATED FACTORS THAT AFFECT PROJECT SUCCESS

This section of the questionnaires measures design-related problems which could affect the success of a project.

Please indicate your answers using the following 5 – point scale where:

1 = Extremely Unlikely (EU), 2 = Unlikely (U), 3 = Neutral (N), 4 = Likely (L), 5 = Extremely (EL)

Below is a list of design-related problems which might affect the success of a project. Use the scale provided to rate how frequently each problem occurs for your company.
<table>
<thead>
<tr>
<th>DESIGN</th>
<th>CAUSES OF POOR CONSTRUCTION ACTIVITIES</th>
<th>E</th>
<th>U</th>
<th>N</th>
<th>L</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCD1</td>
<td>Frequent design changes</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCD2</td>
<td>Design errors</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCD3</td>
<td>Poor design quality</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCD4</td>
<td>Wrong compilation of designs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCD5</td>
<td>Inexperienced designer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HANDLING</th>
<th>CAUSES OF POOR CONSTRUCTION ACTIVITIES</th>
<th>E</th>
<th>U</th>
<th>N</th>
<th>L</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCH1</td>
<td>Wrong material storage</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCH2</td>
<td>Poor material handling</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCH3</td>
<td>Poor quality of materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCH4</td>
<td>Equipment failure (breakdown)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCH5</td>
<td>Tools not suitable</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WORKER</th>
<th>CAUSES OF POOR CONSTRUCTION ACTIVITIES</th>
<th>E</th>
<th>U</th>
<th>N</th>
<th>L</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCW1</td>
<td>Workers’ mistakes</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCW2</td>
<td>Poor understanding of environmental assessment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCW3</td>
<td>Lack of experience</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCW4</td>
<td>Shortage of skilled workers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCW5</td>
<td>A lot of overtime for worker</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCW6</td>
<td>Poor communication between workers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MANAGEMENT</th>
<th>CAUSES OF POOR CONSTRUCTION ACTIVITIES</th>
<th>E</th>
<th>U</th>
<th>N</th>
<th>L</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCM1</td>
<td>Poor planning</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>DCM2</td>
<td>Poor supervision</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Category</td>
<td>Issue</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>DCM</strong></td>
<td>Lack of coordination among parties</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Non availability of equipment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lack of environmental awareness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>SITE CONDITION</strong></td>
<td>Leftover material on site</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Poor site condition</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Waste pile over time</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Congestion of the site</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lighting problem</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Crews interference</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>PROCUREMENT</strong></td>
<td>Ordering errors</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Shipment errors</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Mistakes in quantity surveys</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Ignorance of specifications</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Waiting for replacement</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>EXTERNAL</strong></td>
<td>Weather conditions</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Accidents</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Pilferage</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Vandalism</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Unpredictable socioeconomic conditions</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lack of law enforcement</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
SECTION E: BARRIERS FACED BY THE CONSTRUCTION COMPANIES IN ACHIEVING SUCCESSFUL PROJECT OUTCOMES

This section of the questionnaire evaluates the constraints faced by the construction companies.

Please indicate your answers using the following 5 – point scale where:

1 = Extremely Unlikely (EU), 2 = Unlikely (U), 3 = Neutral (N), 4 = Likely (L), 5 = Extremely (EL)

TO WHAT EXTENT DO YOU AGREE THAT THE FOLLOWING ARE THE BARRIERS FACED BY YOUR CONSTRUCTION COMPANY?

<table>
<thead>
<tr>
<th>BARRIERS FACED BY THE CONSTRUCTION COMPANIES IN MITIGATING THE IMPACTS OF CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT</th>
<th>EU</th>
<th>U</th>
<th>Z</th>
<th>L</th>
<th>EL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rising costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCF1</td>
<td>Increase in wages</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>RCF2</td>
<td>Lack of materials &amp; supplies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>RCF3</td>
<td>Long-time delay</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>RCF4</td>
<td>Poor quality equipment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>RCF5</td>
<td>Inflation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCF1</td>
<td>Slow delivery of materials &amp; supplies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>TCF2</td>
<td>Government restraints</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
SECTION F: MEASURES TO REGULATE BUILDING CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

This section of the questionnaires explores methods to minimizing the impacts construction activities on the environment in Kinshasa, D.R.Congo.

Please indicate your answers using the following 5 – point scale where:

1 = Extremely Unlikely (EU), 2 = Unlikely (U), 3 = Neutral (N), 4 = Likely (L), 5 = Extremely (EL)
TO WHAT EXTENT DO YOU AGREE THAT THE FOLLOWING ARE MEASURES THAT CAN BE TAKEN TO REGULATE THE CONSTRUCTION ACTIVITIES?

<table>
<thead>
<tr>
<th>MRCA1</th>
<th>Appointment of experienced contractor</th>
<th>EU</th>
<th>U</th>
<th>N</th>
<th>L</th>
<th>EL</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRCA2</td>
<td>Adequate planning</td>
<td>EU</td>
<td>U</td>
<td>N</td>
<td>L</td>
<td>EL</td>
</tr>
<tr>
<td>MRCA3</td>
<td>Decrease variation of orders</td>
<td>EU</td>
<td>U</td>
<td>N</td>
<td>L</td>
<td>EL</td>
</tr>
<tr>
<td>MRCA4</td>
<td>Completed design at the time of tender</td>
<td>EU</td>
<td>U</td>
<td>N</td>
<td>L</td>
<td>EL</td>
</tr>
<tr>
<td>MRCA5</td>
<td>Allocation of adequate project duration</td>
<td>EU</td>
<td>U</td>
<td>N</td>
<td>L</td>
<td>EL</td>
</tr>
<tr>
<td>MRCA6</td>
<td>Proper pre-contract planning</td>
<td>EU</td>
<td>U</td>
<td>N</td>
<td>L</td>
<td>EL</td>
</tr>
<tr>
<td>MRCA7</td>
<td>Use of up-to-date technology</td>
<td>EU</td>
<td>U</td>
<td>N</td>
<td>L</td>
<td>EL</td>
</tr>
<tr>
<td>MRCA8</td>
<td>Appointment of highly experienced technical consultant</td>
<td>EU</td>
<td>U</td>
<td>N</td>
<td>L</td>
<td>EL</td>
</tr>
<tr>
<td>MRCA9</td>
<td>Appointment of the highly experienced committed design team</td>
<td>EU</td>
<td>U</td>
<td>N</td>
<td>L</td>
<td>EL</td>
</tr>
<tr>
<td>MRCA10</td>
<td>Proper project implementation and management</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA11</td>
<td>Reliable pre-contract estimates</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA12</td>
<td>Comprehensive client brief development</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA13</td>
<td>Adequate designs</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA14</td>
<td>Adequate pre-contract project coordination</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA15</td>
<td>Good workmanship</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA16</td>
<td>Employment of experienced site workers</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA17</td>
<td>Timely supply of material</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA18</td>
<td>Ordering the right materials</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA19</td>
<td>Proper implementation of local regulation</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRCA20</td>
<td>Use of appropriate construction methods</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thanks for your kind co-operation in completing this questionnaire and for also helping the construction industry and environmental department with knowledge of construction assessment of environmental impacts of construction activities