

**ADDIS ABABA UNIVERSITY**  
**ADDIS ABABA INSTITUTE OF TECHNOLOGY**  
**SCHOOL OF CIVIL AND ENVIRONMENTAL**  
**ENGINEERING**



**MSc THESIS**  
**ON**  
**THE PRACTICE OF CONSTRUCTION RISKS MANAGEMENT**  
**THROUGH INSURANCE IN THE ETHIOPIAN FEDERAL ROAD**  
**PROJECTS**

BY: GETACHEW YILMA DEBELA

ADVISOR: ABEBE DINKU, *Prof. (Dr.-Ing)*

**MASTER OF SCIENCE IN CIVIL ENGINEERING**  
(CONSTRUCTION TECHNOLOGY AND MANAGEMENT)

*November 2014*  
*Addis Ababa, Ethiopia*

## **ACKNOWLEDGEMENTS**

In the preparation of this thesis many have contributed priceless data, idea, resource books as well as moral support. First and foremost, I would like to express my sincere gratitude to my advisor Prof. Dr.- Ing Abebe Dinku, Addis Ababa Institute of Technology; for his patience, supervision, guidance, expert advice and support throughout the process of this research.

I am deeply grateful to all who have given me assistance in obtaining the information and data related to this work. Particular thanks also go to the experts and staff at the Ethiopian Roads Authority for their willingness to provide me with all the necessary data so that the research work could be carried out. I am also indebted to those people, especially managing directors, team leaders and contract administration division heads, in their respective department and experts in insurance companies, who took time out of their busy schedules to fill the questionnaires.

The moral support from my family will never be forgotten and this work is dedicated to them.

Above all, my thanks go to the Almighty God for giving me the health, strength and endurance until this time.

## TABLE OF CONTENTS

|                                                                  |             |
|------------------------------------------------------------------|-------------|
| <b>ACKNOWLEDGEMENTS .....</b>                                    | <b>i</b>    |
| <b>TABLE OF CONTENTS .....</b>                                   | <b>ii</b>   |
| <b>LIST OF TABLES .....</b>                                      | <b>v</b>    |
| <b>LIST OF FIGURES .....</b>                                     | <b>vii</b>  |
| <b>ABSTRACT .....</b>                                            | <b>viii</b> |
| <b>ABBREVIATIONS .....</b>                                       | <b>ix</b>   |
| <b>CHAPTER ONE .....</b>                                         | <b>11</b>   |
| <b>INTRODUCTION.....</b>                                         | <b>11</b>   |
| 1.1. Background to the Research .....                            | 11          |
| 1.2. Structure of the Ethiopian Road Construction Industry ..... | 13          |
| 1.3. Statement of the Problem .....                              | 15          |
| 1.4. Significance of the Research.....                           | 16          |
| 1.5. Objectives of the Research.....                             | 17          |
| 1.6. Research Methodology .....                                  | 18          |
| 1.7. Scope and Limitations of the Study .....                    | 18          |
| 1.8. Thesis Organization.....                                    | 19          |
| <b>CHAPTER TWO .....</b>                                         | <b>20</b>   |
| <b>LITERATURE REVIEW .....</b>                                   | <b>20</b>   |
| 2.1. Introduction .....                                          | 20          |
| 2.2. Definitions .....                                           | 20          |
| 2.2.1. Definition of Risk .....                                  | 20          |
| 2.2.2 Risk, Hazard and Uncertainty.....                          | 21          |
| 2.3. Risk Management in the Construction Industry.....           | 23          |
| 2.3.1. Introduction .....                                        | 23          |
| 2.3.2. Risk Identification in Construction.....                  | 27          |
| 2.3.3 Risk Classification in Construction .....                  | 27          |
| 2.3.4 Risk Analysis in Construction .....                        | 31          |
| 2.3.5. Risk Response in Construction.....                        | 33          |

|                                                                           |           |
|---------------------------------------------------------------------------|-----------|
| 2.3.6. Risk Monitoring and Control in Construction .....                  | 36        |
| 2.3.7. Principles of Risk Allocation in Construction .....                | 37        |
| 2.3.8. Risk Management in the Ethiopian Road Construction Industry .....  | 39        |
| 2.3.9. Summary .....                                                      | 42        |
| 2.4. Risk Management and Insurance in the Construction Industry .....     | 44        |
| 2.4.1. Introduction .....                                                 | 44        |
| 2.4.2. Definition and Principles of Insurance .....                       | 45        |
| 2.4.2.1. Definition of Insurance .....                                    | 45        |
| 2.4.2.2. Principles of Insurance .....                                    | 45        |
| 2.4.3. Insurability and Uninsurability of Risks .....                     | 50        |
| 2.4.3.1. The Insurability of Risks .....                                  | 50        |
| 2.4.3.2 The Uninsurablity of Risks .....                                  | 51        |
| 2.4.4. Types of Construction Insurances .....                             | 52        |
| 2.4.4.1. Property Insurance .....                                         | 53        |
| 2.4.4.2. Liability Insurance .....                                        | 54        |
| 2.4.5. Role of Insurance for the Construction Industry .....              | 60        |
| 2.4.6. Insurance Companies in Ethiopia .....                              | 61        |
| 2.4.7. Regulation and Supervision of Insurance Industry in Ethiopia ..... | 64        |
| 2.4.8. Summary .....                                                      | 65        |
| <b>CHAPTER THREE .....</b>                                                | <b>67</b> |
| <b>RESEARCH DESIGN AND METHODOLOGY .....</b>                              | <b>67</b> |
| 3.1. Introduction .....                                                   | 67        |
| 3.2. Research Design .....                                                | 67        |
| 3.3. Data Collection .....                                                | 68        |
| <b>CHAPTER FOUR.....</b>                                                  | <b>70</b> |
| <b>ANALYSIS AND DISCUSSION OF RESULTS .....</b>                           | <b>70</b> |
| 4.1. Introduction .....                                                   | 70        |
| 4.2. Analysis of Response .....                                           | 70        |
| 4.3. Analysis and Discussion of Results .....                             | 71        |
| 4.4. Ranking of Risk Factors in the Road Construction Industry .....      | 86        |
| 4.5. Agreement Analysis (Concordance Test).....                           | 89        |
| 4.6. Major Risk Factors Identified .....                                  | 90        |

|                                                                                     |            |
|-------------------------------------------------------------------------------------|------------|
| 4.7. Summary .....                                                                  | 91         |
| <b>CHAPTER FIVE .....</b>                                                           | <b>96</b>  |
| <b>CONCLUSIONS AND RECOMMENDATIONS.....</b>                                         | <b>96</b>  |
| 5.1. Introduction .....                                                             | 96         |
| 5.2. Conclusions .....                                                              | 96         |
| 5.3. Recommendations .....                                                          | 98         |
| <b>5.4. Recommendation for Future Research .....</b>                                | <b>100</b> |
| Appendix-1: Ranking of Risk Factors in the Road Construction Industry.....          | 106        |
| Appendix-2: Insurable and Uninsurable Risks in the Road Construction Industry ..... | 111        |
| Appendix-3: Ranking of Insurance Policies in the Road Construction Industry.....    | 115        |
| Appendix-4: Kendall Concordance Test .....                                          | 117        |
| Appendix-5: Sample Questionnaires .....                                             | 119        |

## LIST OF TABLES

|                                                                                                                             |    |
|-----------------------------------------------------------------------------------------------------------------------------|----|
| Table 2.1: Typical Insurances on a Construction Project-----                                                                | 51 |
| Table 2.2: Property Insurance and Liability Insurance-----                                                                  | 52 |
| Table 2.3: Ethiopian Insurance Companies-----                                                                               | 62 |
| Table 4.1: Overall Survey Response Level-----                                                                               | 71 |
| Table 4.2: Position of Respondents-----                                                                                     | 72 |
| Table 4.3: Respondents' Experience in the Road Construction Industry-----                                                   | 72 |
| Table 4.4: The Level of understanding of the Concept of risk management-----                                                | 73 |
| Table 4.5: Formal Risk Analysis Practice of Respondents-----                                                                | 74 |
| Table 4.6: Client's responses to the ranking of the methods of risks identification-----                                    | 75 |
| Table 4.7: Consultant's responses to the ranking of the methods of risks identification-----                                | 75 |
| Table 4.8: Contractor's responses to the ranking of the methods of risks Identification-----                                | 75 |
| Table 4.9: Who Performs the Risk Analysis in the Organization-----                                                          | 76 |
| Table 4.10: At what Stage of Project Cycle do you perform the Risk Analysis-----                                            | 77 |
| Table 4.11: What Does the Risk Analysis Consists of-----                                                                    | 78 |
| Table 4.12: Risk Allocation Principles Adherence-----                                                                       | 78 |
| Table 4.13: Interaction in Risk Identification, Allocation and Insurance Provision -----                                    | 79 |
| Table 4.14: Client's responses to the ranking of factors in determining whether a risk is insurable or not-----             | 80 |
| Table 4.15: Consultant's responses to the ranking of factors in determining whether a risk is insurable or not-----         | 80 |
| Table 4.16: Insurance Companies' responses to the ranking of factors in determining whether a risk is insurable or not----- | 81 |
| Table 4.17: Contractor's responses to the ranking of factors in determining whether a risk is insurable or not -----        | 81 |
| Table 4.18: Response to the essence of providing insurance policies-----                                                    | 82 |

|                                                                                                                            |    |
|----------------------------------------------------------------------------------------------------------------------------|----|
| Table 4.19: Problems with the provision of insurance -----                                                                 | 83 |
| Table 4.20: Response of Various Contract Groups-----                                                                       | 84 |
| Table 4.21: Response of Consultants-----                                                                                   | 84 |
| Table 4.22: Response of Various Contract Groups-----                                                                       | 85 |
| Table 4.23: Response of Insurance Companies-----                                                                           | 85 |
| Table 4.24: Ten most important risk factors, insurable risks and most used insurance policies by the client-----           | 87 |
| Table 4.25: Ten most important risk factors, insurable risks and most used insurance policies by consultants-----          | 87 |
| Table 4.26: Ten most important risk factors, insurable risks and most used insurance policies by insurance companies-----  | 88 |
| Table 4.27: The ten most important risk factors, insurable risks and most used insurance policies by contractors-----      | 89 |
| Table 4.28: Major risk factors, insurable risks and most used insurance policies (Using the Kendall concordance test)----- | 91 |
| Table 4.29: Major risk factors, insurable risks and most used insurance policies (Using the Kendall concordance test)----- | 92 |
| Table 4.30: The ten major risk factors in the road construction industry-----                                              | 93 |
| Table 4.31: Ten most used insurance policies in the road construction industry-----                                        | 94 |
| Table 4.32: Ten most insurable risks in the road construction industry-----                                                | 95 |

## LIST OF FIGURES

|                                            |    |
|--------------------------------------------|----|
| Figure 2.1: The Spectrum of Risk-----      | 23 |
| Figure 2.2: Risk Management Framework----- | 26 |
| Figure 2.3: Risk Response Mechanism-----   | 34 |

## ABSTRACT

Construction works are hazardous by nature and accidents are frequent and often severe. If one cannot control a risk through a business practice or transfer that risk to someone else through an indemnification clause, then he should manage that risk through insurance. Construction insurance is a practice of exchanging a contingent claim for a fixed payment to protect the interests of parties involved in a construction project. Therefore, the objectives of this research was to conduct an assessment of construction risk management practices and the use of construction insurance as a risk transfer tool in the Ethiopian Federal Road Projects.

The research revealed that contractors and consultants visit project sites as a risk identification mechanism before they submit their tender. However; insurance companies only provide insurance to road projects without visiting project sites before or during construction and do not educate other participants how to control or minimize the occurrence of construction risks. The study also indicated that construction insurance is mainly provided just to meet the demand of the client and most design professionals do not have effective professional indemnity insurance for the service they deliver.

It is therefore; important that all parties involved in road projects improve their risk management practices especially insurers need to enhance their understanding of risk management to assist their construction sector customers' risk management in recognizing potential risks and reducing the probability of occurrence of risks in road construction projects. The parties in road projects are suggested to engage experts to ensure that insurance policies are specifically designed to road projects than adopting standard policy words forwarded by insurance companies.

It is also recommended to construction insurers to get involved in risk identification, allocation and drafting and negotiation of insurance policies before and during construction with client, contractors and consultants. It is advised to regulatory body to make mandatory to consultants to hold professional indemnity insurances when they apply to get license to the concerned authority to give service in the Ethiopian construction industry.

**Keywords:** *Client, Consultant, Contractor, Contract, Indemnity, Insurance, Insurability, Liability, Risk Management and Road Construction.*

## ABBREVIATIONS

|              |                                                          |
|--------------|----------------------------------------------------------|
| <b>AACRA</b> | Addis Ababa City Roads Authority                         |
| <b>AC</b>    | Asphalt Concrete                                         |
| <b>AfDB</b>  | African Development Bank                                 |
| <b>BADEA</b> | Bank of Arab for Economic Development in Africa          |
| <b>CACC</b>  | The Construction Agency Coordinative Committee           |
| <b>CII</b>   | Construction Industry Institute                          |
| <b>CIDB</b>  | Construction Industry Development Board                  |
| <b>DB</b>    | Design-Build                                             |
| <b>DBB</b>   | Design-Bid-Build                                         |
| <b>DBST</b>  | Double Surface Treatment                                 |
| <b>DFID</b>  | Department of Foreign and International Development (UK) |
| <b>EBCA</b>  | Ethiopian Building Construction Authority                |
| <b>ETB</b>   | Ethiopian Birr (Ethiopian currency)                      |
| <b>ETCA</b>  | Ethiopian Transport Construction Authority               |
| <b>ERA</b>   | Ethiopian Roads Authority                                |
| <b>EU</b>    | European Union                                           |
| <b>FDRE</b>  | Federal Democratic Republic of Ethiopia                  |
| <b>FHA</b>   | Federal Highway Agency                                   |
| <b>FIDIC</b> | Federation International Des Ingenieurs Conseils         |
| <b>GDP</b>   | Gross Domestic Product                                   |
| <b>GOE</b>   | Government of Ethiopia                                   |
| <b>IDA</b>   | International Development Association                    |
| <b>IBRD</b>  | International Bank for Reconstruction and Development    |
| <b>KFW</b>   | Kreditanstalt Fur Wiederaufbau                           |
| <b>MoFED</b> | Ministry of Finance and Economic Development             |
| <b>MoWUD</b> | Ministry of Works and Urban Development                  |
| <b>NBE</b>   | National Bank of Ethiopia                                |
| <b>NCHRP</b> | National Cooperative Highway Research Program            |
| <b>NGO</b>   | Non-Governmental Organization                            |
| <b>NPV</b>   | Net Present Value                                        |
| <b>NDF</b>   | Nordic Development Fund                                  |
| <b>OSMPI</b> | Office of Statewide Project Management Improvement       |
| <b>PMBOK</b> | Project Management Body of Knowledge                     |
| <b>PMI</b>   | Project Management Institute                             |
| <b>PRAM</b>  | Project Risk Analysis and Management                     |
| <b>PTA</b>   | Eastern and Southern African Trade and Development Bank  |
| <b>RSDP</b>  | Road Sector Development Program                          |
| <b>RII</b>   | Relative Importance Index                                |
| <b>SMEC</b>  | SMEC-Engineering and Development Consultant              |
| <b>TCDE</b>  | Transport Construction Design Enterprise                 |

|             |                          |
|-------------|--------------------------|
| <b>TOR</b>  | Terms of Reference       |
| <b>UK</b>   | United Kingdom           |
| <b>UNIC</b> | United Insurance Company |
| <b>USD</b>  | United States Dollar     |
| <b>WB</b>   | World Bank               |

# CHAPTER ONE

## INTRODUCTION

### 1.1. Background to the Research

Transport infrastructure is generally considered as an essential element for economic and social development as it provides the links required to make commodity or markets function. The development of any country economically vital sectors such as agriculture, industry, tourism etc. is directly dependent on the existence of a working transport infrastructure system.

In the context of Ethiopia's geography, pattern of settlement and economic activity, transport plays a vital role in facilitating economic development as 95% of the movement of people, and goods is still carried out by road transport. In particular, it is road transport that provides the means for the movement of peoples and agricultural products from rural areas to urban areas and movement of industrial goods, modern agricultural inputs and peoples from urban areas to rural areas. Road transport also provides a means for the utilization of land and natural resources, improved agricultural production and marketing, access to social services, and opportunities for sustainable growth [ERA, 2013].

Recognizing the importance of the road transport in supporting social and economic growth and its role as a catalyst to meet poverty reduction targets, the Government of Ethiopia has placed increased emphasis on improvement of the quality and size of road infrastructure in the country. To address constraints in the road sector, mainly low road coverage and poor condition of the road network the Government formulated the Road Sector Development Program (RSDP) in 1997.

The RSDP has been implemented over a period of sixteen years in four successive phases as follows:

- RSDP I - Period from July 1997 to June 2002 (5 years plan)
- RSDP II - Period July 2002 to June 2007 (5 years plan)
- RSDP III - Period July 2007 to June 2010 (3 years plan)
- RSDP IV - Period July 2010 to June 2015 (5 year plan, 4 years elapsed)

In 1974 the total road network in the Country was only 9,260 km and this figure has increased over the Sixteen years of the RSDP to a total of 80,630 km of roads excluding routine maintenance work and community roads [ERA, 2013]. The total budget for the planned works during this period amounted to ETB 135.9 billion (USD 9.9 billion). The total amount disbursed in the same period is ETB 142.12 billion (USD 10.2). Since the start of the RSDP, a number of road projects are under construction and a lot more are expected to be commenced in the coming years [ERA, 2013].

The Ethiopian Roads Authority as a Government implementing agency has been administering huge budget every year which is allocated to the road infrastructure development, however, this government investment of huge capital to the road sector is not free from challenges. The review of the implementation of the Road Sector Development Program (RSDP) shows that road projects in Ethiopia encounters a number of challenges [Zerfu, 2009].

It is understood that construction projects usually have in force several simultaneous contractual arrangements: between the client and consultant, between the client/consultant and general contractor and between the general contractor and his several sub-contractors and suppliers. These contracts can establish a complicated structure of responsibility for damages arising out of construction operations [Abebe, 2000].

The development status of the domestic construction industry and the clarity and comprehensiveness of documents (survey, design, tender and contract documents) used in the process can be considered as the two major factors for the challenges faced by the Ethiopian Roads Authority (ERA) in road construction projects. The immediate consequence of such factors is an increase in project costs than originally budgeted, among others [Zerfu, 2009].

It is, therefore, important to reduce losses in terms of monetary or life with efficient management of construction projects by clients, contractors and consultants. Application of various project management techniques have to be made from the conception to the completion stage, which include managing various risks associated with project in its every stage.

The construction industry, perhaps more than most of other industries, is overwhelmed by risks. If these risks are not dealt with satisfactorily, there is a maximum likelihood of cost

overruns, time delays and low quality, resulting in dissatisfaction of clients and the public at large [Nadeem, 2010].

Managing various risks in construction projects has been recognized as a very important management process in order to achieve the project objectives in terms of time, cost, quality; safety and environmental sustainability. The Construction work involves the production of a long lived capital product. It is the result of the complex interaction of design, construction, finance, law and insurance. This interaction involves a wide range of risks, and one of the fundamental ways of dealing with risk is through insurance [Gould, 2003].

The potential severity of accidents and the frequency with which they occur require that contractors and consultants protect themselves with a variety of complex and expensive insurance coverage. Without adequate insurance protection, the contractors and consultants would be continuously faced with the monetary possibility of serious or even ruinous financial loss [Abebe, 2000].

The practices of successful highway agencies worldwide suggest that proper risk management system is an integral part of their effective management and the most compelling argument for pursuing risk assessment and allocation as a standard practice for highway programs is that the best agencies and organizations are doing it with great success [Keith, 2006].

Therefore, the aim of this research work is to evaluate the risk management practices of the client (ERA), contractors, consultants and insurance companies in the Ethiopian road construction industry through insurance provisions in road construction projects.

## **1.2. Structure of the Ethiopian Road Construction Industry**

Road design and construction works were used to be executed mainly by government owned enterprises until the introduction of free market economic policy in 1991. The change of centrally planned economy to market based has allowed many private contractors and engineering consultants to emerge in the road sector. According to the prevalent traditional, Design-Bid-Build mode of contract, and recent Design and Build, the main players of the road construction sector of Ethiopia comprises of the client, consultants, contractors ,financers and Banks and Insurances which have been described as follows;

**a) The Client**

Generally there are three major Clients in the construction sector: The public sector, Developers and Private owners. In developing Countries like Ethiopia, the Public sector is the major Client particularly for large and complex projects. Accordingly, the Ethiopian Roads Authority on behalf of the Federal Government of Ethiopian acts as a Client with the mandate of regulating the road sector. This involves but not limited to identification and prioritization of projects, procurement of service and works contracts, contract administration of projects and the maintenance of completed projects that are handed over to the Client.

**b) Consultants**

The first two pioneer government owned consultants in road and building sector in Ethiopia were the former Design Division and Contract Administration Divisions of governmental offices, EBCA and ERA. Consultancy services were used to be monopolized by these two firms until the privatization era whereby private companies emerged in the market and created a competing environment.

Majority of domestic consultancy firms in Ethiopia are established by group of founding professionals who have different expertise. Predominantly, consulting firms run with minimum permanent employees to ensure their economic viability by limiting their fixed overhead cost to the least. The general trend in consultancy service is to give a package of studies to one firm that takes full accountability of delivering the whole services. Moreover, most consultants are multidisciplinary providing services in Building works, Road works, Geotechnical studies, Water works and Management services taking the broadening of their market share in the construction sector [Bezawit, 2010].

**c) The Contractor**

The main Contractors participating in road construction works are the previous ERA own force and the current Ethiopia Road Construction Corporation, local private contractors and international contractors. The record on a number of projects since 1997 indicates that out of the 985 contracts (both construction and consultancy) awarded over the last sixteen years of the RSDP, some 715 contracts were awarded to local companies. The majority of these contracts, 62%, were for consultancy services, with 38% for road construction

works which proved the high involvement of the local contractors in the road sector [ERA, 2013].

#### **d) Development Partners**

Several funding agencies are involved in the road sector as part of bilateral and multilateral relationships with the government. The following are the major contributors in the form of grant aid, credit, and soft loans [ERA, 2013].

- Multilateral Financers: IDA, BADEA, EU, ADB, SDF, NDF, OFID, DFID and KFW
- Bilateral Donors: The Governments of Ireland, Italy, China and Japan
- Local Sources: Road Fund and Government Treasury.

The involvement of financers is not limited to financing matters but they also involve in introducing best practices that enhance the capacity of the domestic construction industry as a way forward to ensuring sustainability of the projects they finance. The Road Sector Development Plan is ideal means of handling integrated plan in the road sector involving financing plans [ERA, 2013].

#### **e) Banks and Insurances**

In all construction activities, costs occur earlier than payments. Hence, contractors in developing countries often obtain the capital resources to finance the costs of construction [Melese, 2006]. The financial institutions (Banks and Insurances) contribute a vital role for a construction industry by providing different services and facilities. According to the study by Melese [2006], all banks are providing the following services and facilities for the construction firms:

- Construction loans,
- Insurance coverage,
- Bonds and Guarantees,
- Overdraft facilities and
- Truck/ equipment loans.

### **1.3. Statement of the Problem**

Construction industry being a risky business, it is exposed to numerous types of risks. The provision of insurance is generally considered important and indeed in the event of a major loss, the insurance may be the only viable means of repaying financiers or ensuring that the

project is back on track.

However, paradoxically, rarely does insurance receive the attention it deserves, either within the overall context of the deal in risk management or in the detail of the interrelationship between the drafting of the construction contract and the insurance wording [Palmer, 1996].

In applying the basic concepts of risk management through insurance in the construction industry, this paper will focus on the following questions, while being mindful of the overriding objective of promoting proper risk assessment and allocation in the most possible effective and cost saving manner.

1. Why it is useful to consider risk management through insurance in the road construction projects?
2. How can insurance products be effectively used to manage risks in road projects?
3. Do client, consultants, insurance companies and contractors are interacting one another in taking the advantages of identification and allocating risks to the party who is supposed to better control and manage it?

Therefore, the study will assess the practices of clients, contractors, consultants and insurance companies of risk management through insurance in the Ethiopian Federal road projects.

#### **1.4. Significance of the Research**

Construction insurance is a major method of managing risks in the construction industry. Its primary function is to transfer certain risks from clients, contractors, subcontractors and other parties involved in the construction project to insurers to provide contingent funding in time of difficulty. Construction insurance plays an increasingly important role in assuring the success of projects, with insurers sharing losses resulting from natural disasters and other contingencies.

Insurance is, of course, only one means of managing risks associated with projects. It needs to be put into context and understood that not every risk can be insured against, insured against adequately or insured for a price that is acceptable. Construction insurance does not receive the attention it deserves as a result of lack of proper risks management practices in the construction industry. The research sought to identify insurable risks

and the types of insurance policies typically involved in the Ethiopian road construction industry.

Hence, the findings of this research work are expected:

- To contribute towards the enhancement of project risk management practices in the Ethiopian road construction sector;
- To indicate the role of insurance in construction risk management; and
- To draw attention to regulatory body of the government in the construction of road projects to impose rules and regulations on risk and insurance assessment based on the outcomes of the research.

Hence, government agencies, private consulting and contracting firms, insurance companies plus practicing Engineers and/or architects etc. may benefit from the results of this research. In addition, it is hoped that the findings of this research may stimulate other researchers to conduct further research.

## **1.5. Objectives of the Research**

The general objective of this study is to review the risk assessment and allocation practices of parties involved in the Ethiopian Federal road projects and to discuss the significance and importance of construction risks management of projects under taken by client (ERA), contractors, consultants and insurance companies.

The specific objectives of the research are:

1. To examine the sources of insurable construction risks perceived to be encountered in the Ethiopian road construction industry, and the types of construction insurance policies employed in managing them;
2. To assess and analyze the practices of the employer (ERA), contractors, consultants and insurance companies in risk sharing in road construction projects;
3. To highlight the laws set by the Ethiopia government to regulate the insurance business and regulatory requirement in relation to insurance transaction; and
4. To recommend management strategies to insurance companies, construction firms as well as employer (ERA) in the use of insurance as a tool for risk transfer in the Ethiopian road construction industry.

## **1.6. Research Methodology**

The study was carried out using a three phase approach. The first was to review the relevant literature on the subject of risk management and insurance, in particular looking at insurance as means of risks transfer from literature of previous researchers. In the second phase, a pilot study which took the form of structured questionnaire was conducted with selected insurance companies, contractors, client and selected experts (professionals) in the Ethiopian road construction industry. In the third phase, conclusions and recommendations are drawn from the outcome of the analysis of the results of the second phase.

The structured questionnaires survey was in three main parts as follows:

- (a) Background information – collecting the personal data of respondents and their organization, their experience in the Ethiopian road construction industry.
- (b) General perception of risk management and insurance – gathering the respondents' familiarity with the concept of risk management and insurance practices in the Ethiopian road construction industry. This part of the questionnaire explored the respondents' level of knowledge of risk response especially risks transfer through insurance.
- (c) The final phase of the research was used to analyze the data collected using qualitative method of data analysis to meet the aforementioned research objectives.

## **1.7. Scope and Limitations of the Study**

Although the Ethiopian government through its implementing agencies: the Ethiopian Roads Authority (ERA), Addis Ababa City Roads Authority (AACRA), and Regional Rural Roads Authorities has started a major road sector development program to increase the road network in the country which includes new, upgrading and rehabilitation projects, this study has focused on only on the Federal road projects undertaken by the Ethiopian Roads Authority (ERA).

All professionals selected for the collection of data were personnel that are involved in road projects implemented in Ethiopia and the published/ unpublished data sources are the Ethiopian Roads Authority (ERA) as a client, contractors, consultants and insurance companies.

Thus, specific tools and techniques of risk analysis are not dwelt in detail since the emphasis of this research is to enlighten the importance of risk management through

insurance to achieve project objectives.

## **1.8. Thesis Organization**

The research is organized into five chapters which are summarized as follows;

The first chapter introduces the research problem and the aim of the study followed by the objectives of the research in achieving the depicted aim. The research methodology concisely addresses why the qualitative research methodology and questionnaire survey are selected among the alternative approaches.

Chapter two is a literature review from professional journals, books, internet searches and discussions with professionals with road design, construction, contract administration experts and insurance experts. This chapter essentially provides a review of the current state of the art in road construction risks management, construction insurances, and construction risks management through insurance.

Chapter three discusses the research methodology followed in order to achieve the objectives of the study and why the qualitative method of research is followed.

In Chapter four the results of the data obtained from the questionnaire survey were presented and discussed accordingly.

Finally, in Chapter five, conclusions and recommendations were forwarded based on the major findings of the study and discussed how the research objectives align with the findings.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1. Introduction

The purpose of this chapter is to discuss about the definition of risk and its management from construction industry perspective. It also examines the practice of risk management through insurance in the construction industry by evaluating responsibility and liability in construction. The main purpose of this research is to indicate the importance of risk management through insurance by examining various construction insurances that are applicable in the construction industry. The comprehensive literature review is conducted with an aim to address the objectives of the research.

#### 2.2. Definitions

##### 2.2.1. Definition of Risk

The future is largely unknown. Most business decision making takes place on the basis of expectations about the future. Making a decision on the basis of assumptions, expectations, estimates and forecasts of future events involves taking risks [Raftery, 1994].

The word risk is quite modern; it entered the English language in the mid-17th century, coming from the French word *risqué* and in the second quarter of the 18th century the Anglicized spelling began to appear in insurance transactions [Flanagan, 1993].

The Oxford Advanced Learners Dictionary [2010] defines risk as the possibility of something bad happening at some time in the future; a situation that could be dangerous or have a bad result.

Unlike the usual dictionary definition of “risk” which refers only to undesirable events; interpretation of risk includes both downside and upside variations in the values involved. Bowen [2005] stated that despite the largely negative connotation of risk that prevails today, it has to be conceded that one person's risk may be another's opportunity to profit.

PMBOK guide fifth edition also describes risk as an uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objective. Risk can travel in two

directions: the outcome may be better or worse than originally expected [Raftery, 1994]. Chapman [1991] has also defined risk as an exposure to the possibility of economic and financial loss or gain, physical damage or injury, or delay as a consequence of the uncertainty associated with pursuing a particular course of action.

Whichever definition is preferred, the important point to remember is that, in dealing with risk, all four aspects should be considered [Bowen, 2005]:

- The probability that an event will occur;
- The event and its nature;
- The consequences of that event; and
- The period of exposure to the event (and to its consequences if that is also relevant).

In context of insurance, for a risk to be acceptable by an insurer, it has to be a “pure risk” which means it has the downside of the effect only (opportunity for loss only).

### **2.2.2 Risk, Hazard and Uncertainty**

#### **a) Hazard and Risk**

There are different definitions of risks and hazard based on the different perspectives. The definition of hazard is given in British Standard BS No. 4778 as a situation that could occur during the lifetime of a product, system or plant that has the potential for human injury, damage to property, damage to the environment, or economic loss. Hazards are classified in the same British Standard into four categories as: negligible; controlled or marginal; critical and catastrophic.

These categories are so designated by the effect produced once the hazard materializes. Therefore, it is usually assumed that a catastrophic hazard would result in loss of life, personal injury, financial loss, physical or tangible damage and loss of time; a critical hazard would result in personal injury, material damage, financial loss and loss of time requiring immediate attention to prevent further damage; a marginal hazard would result in financial loss, loss of time and malfunction that could be corrected; a negligible hazard would result in only slight damage which could be disregarded [Bunni, 2003].

The two words ‘hazard’ and ‘risk’ are generally used interchangeably and are sometimes confused with each other. However, there is, in fact, an important and subtle difference between the two words and if the definition of ‘hazard’ is as given earlier, then ‘risk’ is defined in British Standard No. 4778 as a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

Based on the definition of the words ‘hazard’ and ‘risk’ given above, risk may be expressed in the form of a mathematical equation, as follows:

$R=P \times C$  Where; R= Risk; P=Probability or frequency of the occurrence of a defined event  
C= Consequences of the occurrence of that event

#### **b) Risk and Uncertainty**

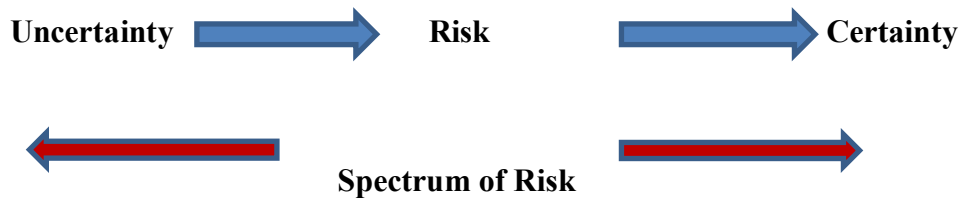
In the context of the management and economics of construction projects, a working definition of risk and uncertainty would be along the following lines [Raftery, 1994]:

Risk and uncertainty characterize situations where the actual outcome for a particular event or activity is likely to deviate from the estimate or forecast value.

The term uncertainty is used in most of scientific literature concerning risk management. Theoretically, it can be defined as a lack of certainty involving variability and/or ambiguity [Brauers, 1986]. Alike uncertainty management is concerned as managing perceived threats and opportunities and their risk implications but also managing the various sources of uncertainty which give rise to and shape risk, threat and opportunity [Chapman, 2003].

Every construction project is unique, with unique data, environment and includes a high degree of information’s uncertainty. All construction projects experience the unexpected situations and uncertainties, during their implementation that is why project managers must be ready for it. They must be supported by risk management to identify, analyze, control, and report risk [Kleim, 1998]. Hence, the concept of uncertainty could lead to opportunities as well as risks as can be illustrated in Figure 2.1.

Figure 2.1: The Spectrum of Risk (Source: Best Practice Guideline A5: Managing Construction Procurement Risks [CIDB, 2004].



|                |                     |                      |
|----------------|---------------------|----------------------|
| Unknown        | Known               | Known                |
| Unknown        | Unknown             | known                |
| No information | Partial information | Complete information |

## 2.3. Risk Management in the Construction Industry

### 2.3.1. Introduction

Risk management is now widely accepted as a vital tool in the management of projects, although risk management has become firmly institutionalized across the industry sectors, it is only comparatively recently that this has extended to include the construction industry [Norman, 1993].

As the most common and typical project types, construction projects have several characteristics such as specific objective, time limit, financial constraints and economic requirements, special organizational and legal conditions, complexity and systematic characteristics and for that each investment project itself is a complex system. Especially for the construction projects, there are many risk facets and complicated relations, which will influence it. The complicated relations include direct, indirect, obvious, implicit or unpredictable [Kuang, 2010].

The subject of risk, its assessment, allocation and management in construction projects has been developed and applied on an increasing scale over the last twenty years [Bunni, 2003]. Despite increasing efforts to assign risks clearly and contractually on the basis of sound risk allocation principles, it appears that some risks are best managed jointly i.e. by synergizing the experiential knowledge, resources and sustained efforts of all major project participants [Kumaraswamy, 2001].

A successful construction project depends on how well project participants manage project risks. Risks are managed through sound business and construction practices and through careful preparation and review of the project contract documents. A significant component

of successful risk management begins with how well the project participants allocate risks at the contract formation stage.

Based on the statistics gathered in the past three decades on topics, such as disputes in the construction industry and international arbitration, accidents at work and exposure to natural hazards around the world, it can be concluded that construction projects are sensitive to an extremely large matrix of hazards and thus to risks [Bunni, 2003]. This sensitivity is due to some of the inherent characteristics of construction projects, which are summarized as follows:

- (a) The time required to plan, investigate, design, construct and complete a construction project spans such a lengthy period that it is often greater than the period of cyclical recurrence, known as the 'return period', of many of the hazards to which such projects are exposed. For example, the hazard of rainfall has usually a return period of one year depending on the time for the rainy season. Therefore, the risks associated with rainfall on a particular project would have to be assessed and managed for the number of years taken to complete it. Any reduction in the period of construction introduces its own risks.
- (b) The number of people required to initiate, visualize, plan, finance, design, supply materials and plant, construct, administer, supervise, commission and repair any defects in a construction project is enormous. Such people usually come from different social classes and in international contracts, from different countries and cultures.
- (c) Many civil engineering projects are constructed in isolated regions of difficult terrain, sometimes stretching over extensive areas and exposed to natural hazards of unpredictable intensity, frequency and return period.
- (d) The materials selected for use generally include a number of new products of unproved performance or strength. Advanced and complex technology is also necessary in some construction projects.
- (e) Extensive interaction is required between many of the firms involved in construction, including those engaged as suppliers, manufacturers, subcontractors and contractors, each with its own different commitments and goals.
- (f) Construction projects are susceptible to risk cultivation by the parties themselves or by

others associated with them or advising them.

It is not difficult to anticipate the typical and common risks of the project based on the previous experience, but it requires analysis to determine the significance of the risk on the project objectives and to take proactive actions to minimize risk effect [Asnake, 2010]. According to Nadeem et al. [2010], the track record of construction industry is very poor in terms of coping with risks, resulting in the failure of many projects to meet time schedules, targets of budget and sometimes even the scope of work.

Rezakhani [ 2012] indicated some of the construction risks as: changes in scope to meet project objectives, performance failure or environmental impact, specific delays, e.g., strikes, labor or material availability, extreme weather, rejection of work, impacts of accidents, fire, theft, unpredictable price changes, contractor insolvency, claims settlement or litigation, strikes, terminations, organizational breakdown and inaction or wrong action due to incorrect information or communication failure.

According to Nadeem et al. (2010), the common sources of risks in construction industry are: changes in project scope and requirements, design errors and omissions, inadequately defined roles and responsibilities, insufficiently skilled staff, subcontractors, inadequate contractor experience, uncertainty about the fundamental relationships between project participants, new technology, unfamiliarity with local conditions and Force majeure.

Risk management provides a clear and structured approach to identifying risks. To mention some of the advantages of risk management as indicated by Nadeem [2010] are:

- Achievement of objectives
- Shareholders reliability
- Reduction of capital cost
- Less uncertainty and
- Creation of value

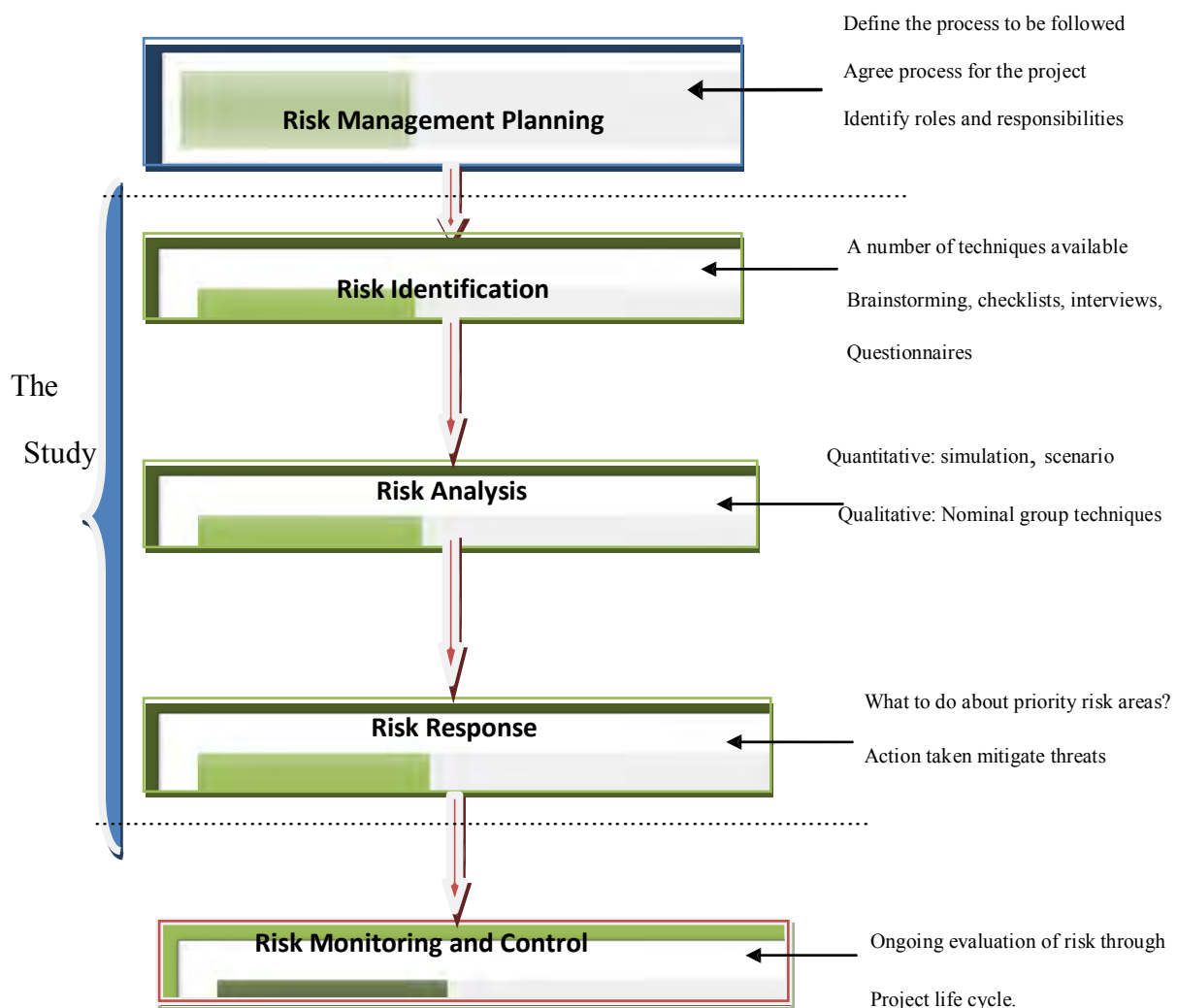
Risk analysis and management in construction depend mainly on intuition, judgment and experience. Formal risk analysis and management techniques are rarely used due to a lack of knowledge and to doubts on the suitability of these techniques for construction industry activities [Akintoye, 1997]. It is, therefore, extremely relevant for the construction industry and those involved in it to understand the concept of risk and to know how to properly manage the risk matrix generated when a construction project is initiated [Bunni, 2005]. Since risk cannot be eliminated, but should be managed, it is better to be proactive than

reactive [CIDB, 2004].

Risk management strategy is a means that enables projects practitioners to visualize the uncertainty of the project to take the necessary steps timely to mitigate its effect on the project objectives. One of the major purposes of the risk management strategy is to ensure that all the likely occurrence of risks managed effectively [ERA-SMEC, 2008].

The PMI's project management book of knowledge [2013] describes risk management as the systematic process of identifying and analyzing and responding to project risk as depicted in Figure 2.2 below. It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of events adverse to project objectives. Each components of risk management are discussed here under in the perspective of construction projects.

Figure 2.2: Risk Management Framework (Source: PMI PMBoK, 2013).



### **2.3.2. Risk Identification in Construction**

Risk identification is the process of identifying risks that can adversely affect the project cost and schedule and also the opportunities that can reduce project costs or result in a reduction in project duration [Touran, 2006].

The objectives of risk identification are to identify and categorize risks that could affect the project and to document these risks and the outcome of risk identification is a list of risks [NCHRP, 2009]. The main objective is to see that the major risks that could impact on the project most adversely are not left unidentified. Most commonly a relatively small percentage of key risks are likely to account for the majority of the time and cost implications of the entire risk [Mead, 2007].

Risk identification is often undertaken through a variety of methods which may include checklists, brainstorming, visits to site, corporate experience (or drawing upon consultants or subcontractors who have experience in the particular industry segment), analysis of prior projects, the use of organizational charts to review internal structures and flowcharts to review process issues and through research, interviews and surveys of parties likely to be impacted by the proposal [Mead, 2007].

According to Akintoye and MacLeod [1997], among the variety of the risk identification techniques, checklists, brainstorming and flowcharts were most commonly used in the construction sector.

The process of identification and analysis of risk should be continuous process from concept to operation phase of the project to maximize the risk control mechanism of the project and ensure the completion of the project on time and budget. The result of this process will be recorded in the risk register for subsequent identification process [Asnake, 2010].

### **2.3.3 Risk Classification in Construction**

Risk classification is a significant step in the risk management process, as it attempts to structure the diverse risks affecting a construction project. There are many approaches in literature for construction risk classification. Owing to the various nature of risks which may be encountered in a major project and the differing weights which may attach to their consequences, it is not uncommon for parties to seek to identify these risks under major

headings or categories [Mead, 2007].

Baloi [2012] suggested risk classification based on the structure of the environment surrounding a project or organization by dividing into three distinct layers: outer layer or general environment; operational environment; and inner layer or internal environment. Both the general and operational environments can be considered external environments. The general environment comprises domains that are broad in scope and have little immediate and direct impact on the organization's activities. The general environment comprises five basic elements or domains, namely economic environment, political environment, social environment, technological environment and physical or natural environment.

The operating environment is the external environment comprising factors that have more specific and immediate impact on the organization or project. These factors include suppliers, clients, sub-contractors, consultants and competitors. Finally, the internal environment is the inside environment that has direct, close, and immediate impact on the organization. The internal environment is basically concerned with organization's resources, which include financial, physical, human, and technological resources, as well as managerial values and ethics.

In this context, opportunities and threats/constraints from the external environment and strengths and weaknesses/constraints from the internal environment are strongly related to risks.

Bunni [2003] has also classified risks in chronological manner that affect, in principle, the construction trinity of owner, professional team and contractor and, in certain circumstances, the community at large as risks with the feasibility stage, risks with the design stage, risks with the construction stage and to the post-construction stage as enumerated below.

**(1) Risks with the feasibility stage:**

- Owner's choice of professional team and advisers
- Owner's brief to the professional team
- Choice of site
- Adequacy of soil investigations
- Adequacy of surveys and inspections
- Adequacy of finance and related calculations
- War, nuclear reaction, etc.

**(2) Risks with the design stage:**

- Inappropriate choice of design with respect to others and to society
- Negligence and lack of care
- State of the art, codes and technical knowledge
- Lack of knowledge, inadequate checking and work carried out in haste
- Lack of communication
- Failure to take account of foreseeable problems
- Use of untested and unproven techniques
- Inadequate performance of mechanical and electronic equipment
- Lack of safety precautions
- Choice of contractor and nominated subcontractor

**(3) Risks with the construction stage:**

- Excessive Rainfall
- Flood and inundation
- Wind and storm
- Subsidence, landslide, rockslide and avalanche
- Extremes of temperature
- Earthquake
- Adverse geological and underground characteristics
- Acts of man in relation to nature of site— underground obstructions
- Acceptability of project by local residents
- Extended duration of construction
- Technical complexity and innovation in design requiring new methods of construction and/or erection
- Removal of support
- Dangerous substances and items during construction and/or commissioning
- Defective design
- Defective workmanship and material
- Defective design, workmanship and quality control
- Mechanical and electrical breakdown
- Inadequate site management
- Ground movement

- Subsidence
- Explosion and fire
- Vibration and oscillation
- Defective temporary works and their design
- Corrosion
- Collapse

**(4) Risks during construction associated with Acts of Man**

- Human error
- Negligence and lack of care
- Fraud and infidelity
- Programming the work
- Theft and burglary
- Lack of communication
- Failure to comply with insurer's conditions and requirements
- Riot and civil commotion
- Strike
- Incompetence
- Malicious acts
- Inefficiency and delays
- Inadequate site supervision
- Variations from contract documents
- Illegal activities
- Risks associated with dispute resolution

**(5) Risks associated with the post-construction stage**

- Risks associated with safety
- Risks associated with serviceability
- Risks associated with fatigue
- Risks associated with fire and arson
- Acts of God in relation to nature of site—topography and surface water run-off
- Risks associated with natural hazards
- When risks of natural hazards are added to human mistakes
- Risks associated with man-made hazards, including political risks

- Risks associated with fitness for purpose
- Risks associated with project operation
- Risks associated with wear and tear during the project's designed life span

Bunni [2003] further identified a group of risks connected with the political, financial, and sociological and status of the country in which the site is located. They can be enumerated as: external stability of government; political risks; internal stability of government; financial stability and economic risks; red tape (formalities); transit to site and condition of infrastructure; taxes; and legislation and stability of the legal system. Nadeem [2010] classified risks as technical, operational or business aspects of projects; acceptable or unacceptable; manageable and unmanageable.

It is suggested that it is wise for each of the participants to consider each and every risk which they identify as being relevant to the project as a whole, and thereafter seek to categorize those risks by the manner in which they are proposed to be “treated”, rather than seeking to “fit” risks into general categories or even more alarmingly seek to allocate them at the outset to the respective parties as matters of concern for the other project participants [Mead, 2007].

### **2.3.4 Risk Analysis in Construction**

Risk analysis involves quantifying the impact and the probability of occurrence of risks. After identification and classification of the probable risks, their impacts on the project objectives need to be assessed to develop proper response. Risk analysis can also be described as short listing risks with the highest impact on the project, out of all threats mentioned in the identification phase [Cooper et al. 2005].

It has been concluded that the nature of risks under consideration is determinant in the selection of modeling and analysis techniques [Baloi, 2012]. There are two methods to determine risks in a project, namely the qualitative and quantitative approach. The quantitative analysis relies on statistics to calculate the probability of occurrence of risk and the impact of the risk on the project. The qualitative approach, on the other hand, relies on judgments and it uses criteria to determine outcome.

The two broad categories of risk analysis techniques are presented briefly as follows;

#### **a) Qualitative Risk Analysis**

Qualitative risk analysis assesses the priority of identified risks using their probability of

occurring, the corresponding impact on project objectives if the risks do occur, as well as other factors such as the time frame and risk tolerance of the project constraints of cost, schedule, scope, and quality [OSPMI, 2007]. It involves assessment of risks using risk matrix to determine their likelihood and potential effect on the project objectives.

A common qualitative approach is the precedence diagramming method, which uses ordinal numbers to determine priorities and outcomes. Another way of employing qualitative approach is to make a list of the processes of a project in descending order, calculate the risks associated with each process and list the controls that may exist for each risk [Nadeem, 2010].

#### b) Quantitative Risk Analysis

The quantitative risk analysis process, although not very common in construction projects, is very useful to support project management decisions. This process uses techniques such as sensitivity analysis, probability analysis, Monte Carlo simulation and decision analysis to determine many project assumptions [PMBOK, 2013].

Quantitative risk analysis is the most sophisticated technique and involves determination of the level of impact and probability of occurrence of projects risks [Thomson, 1992]. The quantitative analysis is required for risks that are analyzed in qualitative analysis and have significant effect. The quantitative analysis usually uses the project program and cost estimates to quantify the effect of risks on time and cost constraints of the project.

The output of the quantitative analysis includes the probability of achieving the project objectives including, cost, time and quality. The result can be used by contractors and employers in estimating the contingency amount that may be required to respond for the probable risks to achieve the project objectives. The analysis of the project risk must include the overall impact of the risks on the whole life of the project and this can be achieved by computing the net present value (NPV) of each possible combination of risk impacts using computer based analysis such as Monte Carlo simulation [ERA-SMEC, 2008].

The result of the analysis can also be used in developing appropriate risk management strategy which helps to minimize the negative effect of risk on project objectives. If the risk is found to be insignificant, no response could be required, whereas, particular attention should be taken for risks that could have significant effect on project objectives. In this process the majority of the significant risks managed and the result will be recorded in the risk register

for successive analysis.

However, Akintoye [1997] has identified a number of reasons for not using risk analysis techniques in the construction industry including:

- Lack of familiarity with the techniques.
- The degree of sophistication involved in the techniques is unwarranted for project performance.
- Time plus lack of information and knowledge.
- Doubts whether these techniques are applicable to the construction industry.
- Most construction projects are seldom large enough to warrant the use of these techniques or research into them.
- They require availability of sound data to ensure confidence.
- The vast majority of risks are contractual or constructions related and are fairly subjective, hence they are better dealt with based on experience from previous contracts undertaken by the firm.
- It is difficult to see the benefits.

### **2.3.5. Risk Response in Construction**

Risk response development is a critical element in the risk management process that determines what action (if any) will be taken to address risks evaluated in the identification, qualification, and quantification efforts. Once the risks of the project have been identified and analyzed appropriate risk response strategy must be adopted in order to take the necessary steps to minimize the negative effects of risk on project objectives.

Mead [2007] stressed that instead of simply pricing for risks, there are other opportunities for mitigating risks including: risk elimination (e.g. not proceeding or proceeding on a different basis); risk reduction (e.g. by undertaking further investigations/due diligence); risk transference (e.g. by legal, contractual and insurance); risk retention (e.g. self-insurance, bearing a large deductible, internal management of risk). Risk response occurs to eliminate, mitigate, deflect or accept the risk and logically will reflect the cost benefit of the risk management process [Fewings, 2005]. Generally, risk allocation, or risk response takes any one or combination of risk retention, risk reduction, risk transfer and risk avoidances shown in Figure 2.3.

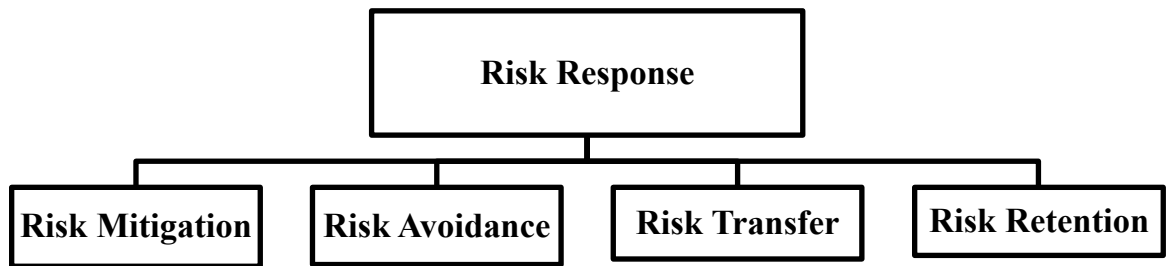


Figure 2.3: Risk Response Mechanism

**a) Risk mitigation:** it involves the activities used to reduce the probability or impact of the risk. Risk reduction can be achieved through taking proactive action to reduce the negative effects of risk.

Mitigation is action taken to reduce the risk and deflection is action taken to transfer the risk. They are not mutually exclusive, but deflection alone is not a way of reducing the probability. Mitigation may have the effect of reducing probability and impact [Fewings, 2005]. According to Cooper [2005], mitigation strategies include:

- Contingency planning
- Quality assurance
- Separation or relocation of activities and resources
- Contract terms and conditions and
- Crisis management and disaster recovery plans

**b) Risk avoidance:** is a strategy for negative risks or threats that involves changing the project plan to eliminate the risk or to protect the project objectives (time, cost, scope, quality) from its impact [OSPMI, 2007]. This can be achieved through activities including using suitable procurement option, change the method of execution and etc.

However, risk avoidance in construction is generally recognized to be impractical as it may lead to projects not going ahead or a contractor submitting an excessively high bid for a project [Akintoye, 1997].

Cooper et al. [2005] list some activities that can help to avoid potential risk:

- More detailed planning
- Alternative approaches
- Protection and safety systems
- Operation reviews
- Regular inspections

- Training and skills enhancement and
- Permits to work

**c) Risk transfer:** it involves shifting the responsibility to respond for risk to another party who is in the better position to deal with it. Risk transfer is not aimed to eliminate or reduce risk. The transfer of risk can be achieved by using the relationship between client, contractor, subcontractor and insurer. If more risk is allocated to the contractor, the greater the project cost as inflated amount of contingency budgeted for risk response by the contractor. Thus, transferring all the project risk to other party is not economical as some of the risks may be better managed by the transferee.

As indicated by Allensworth [1996], there are a variety of factors which should be considered when deciding who will bear a particular project risk. These factors include:

- Who has the greatest amount of control over the risk?
- Does anyone have specialized knowledge relevant to management of the risk?
- Who can best absorb the risk or spread it over the largest pool of transferees?
- Who will receive the greatest financial benefit from proper management of the risk?
- What are the statutory and common law limitations of risk transfer in the projects legal jurisdiction?
- What is the custom in the industry and does that custom make sense in this particular situation?
- What are the relative bargaining positions of the parties, including such factors as size, market conditions and the parties' reputations for flexibility in contracting?

Many large scale projects purchase insurance for risks ranging from theft to fire to transfer project risks and by doing so; the risk is effectively transferred to the insurance company in such a way that if a disaster occurs, the insurance company would be liable to pay the costs associated with the disaster. Insurance certainly is the most direct method of transferring risk; however, there are other methods as well [Nadeem, 2010]. For example, a fixed price contract with a contractor states that work will be done for a pre-specified amount. Fixed schedule can also be added to such a contract and penalties are imposed in case of overruns.

**d) Risk retention:** it involves activities used to absorb the effect of risk. Risks that have no

significant effect and are repetitive can be effectively managed through retaining the responsibility by the owner of the project. There are two types of risk retention, i.e. passive retention and active retention [Rahman, 2013].

Passive risk retention (sometimes called non-insurance), acknowledges the existence of risk without responding further and occurs through negligence, ignorance or absence of decision, e.g. a risk has not been identified and handling the consequences of that risk must be borne by the contractor performing the work.

Active risk retention (sometimes referred to as self-insurance) is a deliberate management strategy after a conscious evaluation of the possible losses and costs of alternative ways of handling risks to allocate an essential allowance to support a contingency strategy for projects whenever necessary.

Risk retention is a strategy that is adopted because it is either not possible to eliminate that risk from a project or the cost in time or money of the response is not warranted by the importance of the risk [OSPMI, 2007].

#### **2.3.6. Risk Monitoring and Control in Construction**

Risk monitoring is the final stage of risk management cycle. The major role of risk monitoring is to ensure the effectiveness of the risk management system including identification; analysis and response are applied to the project [IRM, 2002].

Risk monitoring system is required to maximize the effectiveness of risk response towards meeting the project objectives. Risk monitoring process also used to indicate the need for revision of cost and program in relation to the response for risk [ERA-SMEC, 2008]. Another important aspect of risk monitoring is to ensure that actual events are recorded for use in future projects. Risk register is a record system in which the information including the identified risks and the proposed strategy as well as its result will be recorded for use of subsequent risk management activities.

Risk monitoring and control involves implementing the risk plan, which should be an integral part of the project plan. Two key challenges are associated with monitoring and control. The first is putting the risk plans into action and ensuring that the plans are still valid. The second is generating meaningful documentation to support the process. IRM (2002), suggested that any monitoring and review process should also determine whether:

- The measures adopted resulted in what was intended
- The procedures adopted and information gathered for undertaking the assessment were appropriate
- Improved knowledge would have helped to reach better decisions and identify what lessons could be learned for future assessments and management of risks

### **2.3.7. Principles of Risk Allocation in Construction**

The process of determining and allocating risk is fundamentally linked to the drafting of the conditions of contract, which is effectively the choice of standard form of conditions of contract and any amendments thereto [Premaraj, 2005]. Whether the contract is for construction, construction engineering and inspection, design, design-build, or some other aspect of highway construction management, it defines the roles and responsibilities for risks. Risk allocation in any contract affects cost, time, quality, and the potential for disputes, delays, and claims [FHWA, 2006]. Engineering and construction contracts incorporate specifications, drawings and schedules to communicate the objectives of the contract. The contract is the vehicle for risk allocation.

The purpose of a contract is to establish the rights, duties, obligations and responsibilities of the parties and to allocate the risk [Norman, 1993]. Contracts have evolved as a method of documenting commercial transactions between parties and expressing the conditions that regulate these transactions. Contracts are part of a legal system that seek to balance freedom and control, and dispense justice and they are perceived as an efficient method of protecting the interests of the parties participating in commercial transactions [ERA-SMEC, 2008].

The simplest definition of a contract is ‘A promise enforceable by law’. A slightly more elaborate definition is ‘An agreement between two or more parties in which each party binds himself to do or forbear to do some act and each acquires the right to what the other promises [Bunni, 2003]. According to Article 1675 of the Civil Code of Ethiopia, a contract is an agreement whereby two or more persons as between themselves create, vary or extinguish obligations of a proprietary nature.

Hence, a contract is a legally binding agreement between two or more parties in which each party binds itself to the other party to do something, and each party acquires the right to what the other party promises.

Prerequisites for a typical contract include (Article 1678 of Ethiopian Civil Code [1960] :

- A clear intent to create a legal relationship and to be bound by the contents of the contract;
- An agreement between the parties based on an offer by one party and an unconditional acceptance of that offer by the other party;
- An exchange of an act or promise of an act (consideration), such as a promise to perform works or services in exchange for the provision of a benefit (payment);
- A legal capacity to contract by each party where this legal capacity is not exceeded by either party; and
- A legal objective.

The allocation of risks between the contracting parties in a construction contract is one of four criteria usually applied for the choice of the type of contract conditions to be used. The other three are: the allocation of functions that exist in the construction process; the choice of the preferred method of remuneration; and the allocation of the management functions [Bunni, 2003].

The objectives of risk allocation can vary depending on unique project goals, but the four fundamental tenets of sound risk allocation should always be followed [FHWA, 2006]:

1. Allocate risks to the party best able to manage them.
2. Allocate the risk in alignment with project goals.
3. Share risk when appropriate to accomplish project goals.
4. Ultimately seek to allocate risks to promote team alignment with customer-oriented performance goals.

There must also be an appreciation that mere allocation of risk does not mean that the risk at all times will be maintained with the party so allocated since conduct during the progress of a project may cause the risks allocated to switch [Premaraj, 2005]. It was early attempted to formulate an acceptable formula for risk allocation by Prof Max Abrahamson [Abrahamson, 1984]. He said that a Party should bear a construction risk where:

1. It is in his control, i.e., if it comes about it will be due to wilful misconduct or lack of reasonable efficiency or care; or
2. He can transfer the risk by insurance and allow for the premium in settling his charges to the other party and it is most economically beneficial and practical for the risk to be dealt with in that way; or

3. The preponderant economic benefit of running the risk accrues to him; or
4. To place the risk on him is in the interests of efficiency (which includes planning, incentive, innovation) and the long term health of the construction industry on which that depends; or
5. If the risk eventuates, the loss falls on him in the first instance, and it is not practicable or there is no reason under the above four principles to cause expense and uncertainty, and possibly make mistakes in trying to transfer the loss to another.

The job of trying to balance the five principles in practice is the hard one, but at least it is best to work from declared principles rather than undeclared and perhaps unconscious prejudices [Abrahamson, 1984]. Not only would badly managed risks result in economic and/or time loss, but so too does incorrect allocation of risk [Bunni, 2003]. It has been recognized that misallocations of risk is the leading cause of construction disputes [Premaraj, 2005].

Irrespective of the above criteria, however, the allocation of the risks in construction contracts is traditionally based on a sharing between the parties involved, in accordance with the provisions of two contracts usually executed between the parties: the first is a contract for the provision of services between the employer/owner and a professional, be it design or advice, etc. The second is between the employer/owner and a main contractor. From the latter agreement flows another line of risk sharing between the main contractor, on the one hand, and subcontractors, suppliers, manufacturers, insurers and others, on the other hand [Bunni, 2003].

#### **2.3.8. Risk Management in the Ethiopian Road Construction Industry**

Ethiopia's transport system relates predominantly to road transport. However, as one of the developing countries, the country has least developed road transport even among the lowest in Sub Sahara Africa. So, there is high demand of efficient transport system to improve accessibility to mostly rural population and for the overall economic and social development of the country [Asnake, 2010].

The Ethiopian road construction industry is moving towards supporting the poverty reduction activity and to the development of the economy as the Country's economy is based on agriculture, transport infrastructure allows the agricultural communities to access both domestic and international markets; besides, it enables the people get access to hospitals,

schools and other public service facilitates in a better way.

The road construction industry is mainly administrated by the Ethiopian Roads Authority that is the largest road construction employer in the country. There are a number of local and foreign contractors and consultants participating in design, construction and maintenance of road projects. The foreign contractors have been the major implementer of road sector development program during the first phase of the RSDP Program [1997 – 2002]. However, the local firms have shown involvement from second to fourth phases of the program [2002-2015] and as a result the construction industry as well as the capacity of local firms has been substantially improved both financially and technically [ERA, 2013].

There are some local firms working in association with foreign firms in large projects which is helpful to build their experience and capacity. To this end, there are steps being taken by the Government in order to attract more foreign firms to participate in the construction industry. Currently, contractors from China, Korea, India, Japan, Yemen and from others countries are participating in the Ethiopian road construction industry [ERA, 2013].

Out of 985 contracts (both construction & consultancy) awarded over the last sixteen years of the RSDP, some 715 contracts were awarded to local contractors. The majority of these contracts, 62%, were for consultancy services, with 38% for road construction works. The value of civil works contracts awarded to local firms was ETB 41.7 billion until June 2013 [ERA, 2013].

Even if there are recent attempts to shift to Design and Build procurement strategy in some projects, the Ethiopian road construction industry uses dominantly traditional procurement option (design- bid- build) where there are three parties involvement (employer, contractor and the consultant). In this procurement option, the contractor is not responsible for the design but only for the delivery of operations or undertaking works in supervision of the consultant who certifies the executed work. The design work usually carried out by design consultants assigned by the employer and as a result, the client takes responsibility for the design works which is executed by consultant assigned by the client in the relation between the contractor and the client. The selection of contractors is usually made based on least evaluated bidder among those who fulfill the pre- qualification requirements.

Usually, contract documents are developed by the employer or by its representative based on the FIDIC General Conditions of Contracts published in 1987 and 1999. Accordingly, the

contracts follow the FIDIC procedures and risk allocation principles. Apart from that, there are some particular conditions of the contract introduced over the FIDIC General Conditions of Contracts to suite to the country and project situation.

Hence, ideally the contract document should be clear, precise, unambiguous, and comprehensive, suitably grouped and with proper site references. However, most of the contract documents are found to be inconsistent, lacking necessary detailed specification and drawing with under estimation of quantities and even though rarely, with specification which are not practical [ERA-SMEC, 2008]. These are mainly a result of poor service by the design consultants and non pro-active approach to the issues during the construction period by the supervision consultants [Zerfu, 2009].

It is not surprising to find projects suffering of cost overrun and delay in completion mainly caused by lack of risk management system in the construction industry. This problem affects not only the performance of the projects but also the road sector development program and in general the overall economic growth of the country [Asnake, 2010].

Turkey [2011] based on the result of a desk study on the Ethiopian Federal Road Projects, indicated that out of 30 upgrading and rehabilitation road projects investigated, 24 projects (80%) suffered cost overrun in their execution. For these road construction projects, the average cost overrun was found to be 26.95% of the contract amount.

In the Ethiopian road construction industry, formal risk identification and analysis has not been developed to the required level and carried out adequately for projects. Usually decision makers use their experience gained from previous projects to identify and assess the level of impact and the likelihood of occurrence of risks to the project in the industry [Asnake, 2010].

All parties in the Ethiopian road construction industry need to improve their understanding of risk and contingency allowances to cover risks that should be included in the cost estimates, and provide appropriate contingency allowances for each project based on the assessed and expected level of risk instead of arbitrarily allocation [Turkey, 2011].

Hence, it is required to take the necessary steps to curb the prime problems of the projects so as to minimize the negative effects of risks on projects' objectives. This can be achieved through application of effective risk management to projects.

### **2.3.9. Summary**

In order to develop conceptual and contextual basis for the research objectives, in depth literature review has been conducted on identification and management of risk in the construction industry. Accordingly, this section of the literature review has presented some of the crucial findings on risk management practices associated with the construction projects, particularly associated with highway projects.

According to Kleim [1998], every construction project is unique, with unique data, environment and includes a high degree of information's uncertainty. All construction projects experience the unexpected situations and uncertainties, during their implementation that is why project managers must be ready for it. They must be supported by organized risk management practices to identify, analyze, control, and report risks. In addition, some risks are peculiar to one party and some shared with other parties [Baartz, 2003]. Therefore, there are so many conflicts and claims in the whole project life cycle. The different parties have different knowledge and perceptions of risks, which interact with their various objectives and priorities.

Based on the statistics gathered in the past three decades on topics, such as disputes in the construction industry and international arbitration, accidents at work and exposure to natural hazards around the world, it can be concluded that construction projects are sensitive to an extremely large matrix of hazards and thus to risks [Bunni, 2003]. Therefore, risk management provides a clear and structured approach to identifying risks. To mention some of the advantages of risk management are: achievement of objectives, less uncertainty, reduction of capital cost and creation of value [Nadeem, 2010].

Risk analysis and management in construction depend mainly on intuition, judgment and experience. Formal risk analysis and management techniques are rarely used due to a lack of knowledge and to doubts on the suitability of these techniques for construction industry activities [Akintoye, 1997]. However, among the variety of risk identification techniques available, checklists, brainstorming and flowcharts can be used in the construction sector.

When a formal risk analysis is undertaken, it has been concluded that the nature of risks under consideration is determinant in the selection of modeling and analysis techniques [Baloi, 2012]. There are two methods to determine risks in a project, namely the qualitative and quantitative approaches. The quantitative analysis relies on statistics to calculate the probability of occurrence of risk and the impact of the risk on the project. The qualitative

approach, on the other hand, relies on judgments and it uses criteria to determine outcome.

It is, therefore, extremely relevant for the construction industry and those involved in it to understand the concept of risk and to know how to properly manage the risk matrix generated when a construction project is initiated [Bunni, 2003]. Since risk cannot be eliminated, but should be managed, it is better to be proactive than reactive [CIDB, 2004]. From client's perspective, the risk management process should start from briefing of project to the handover to users. Clients are the first party to conduct the risk management process and involve contractors and consultants during the construction stage or at an earlier stage according to the procurement method.

Mead [2007] stressed that instead of simply pricing for risks, there are other opportunities for mitigating risks including: risk elimination (e.g. not proceeding or proceeding on a different basis); risk reduction (e.g. by undertaking further investigations/due diligence); risk transference (e.g. by legal, contractual and insurance); risk retention (e.g. self-insurance, bearing a large deductible, internal management of risk).

It is generally agreed that after identification and analysis of risks, sound risk allocation mechanism between the parties should be sought for the proper function of the parties' relation in a typical construction contract. The risk is best placed with that party involved in the management of a project who is best able to manage the factor which gives rise to it [Flanagan and Norman, 1993]. For example, a client deals with political risks; contractors can control safety risks; design consultants are responsible for design defects.

The objectives of risk allocation can vary depending on unique project goals, but four fundamental tenets of sound risk allocation enumerated hereunder should always be followed according to FHWA [2006]:

1. Allocate risks to the party best able to manage them.
2. Allocate the risk in alignment with project goals.
3. Share risk when appropriate to accomplish project goals.
4. Ultimately seek to allocate risks to promote team alignment with customer-oriented performance goals.

## **2.4. Risk Management and Insurance in the Construction Industry**

### **2.4.1. Introduction**

According to Flanagan and Norman [1993], the construction industry is subject to more risk and uncertainty than many other industries. The development of a construction project from inception to completion takes a long time and involves many phases. Construction projects are sensitive to an extremely large matrix of hazards and risks, due to some of the inherent characteristics of construction projects, which can be listed out as follows [Bunni, 2003]:

- a) The time required to complete a construction project is comparatively high.
- b) Human resource requirement is diverse and changes over time and from phase to phase.
- c) Projects are geographically dispersed and sometimes located in isolated regions of difficult terrain.
- d) A large diverse pool of materials is required with advanced and complex technology.
- e) Extensive interaction among the parties involved in construction lead to team work and inherent conflicts.

All parties involved in a construction project must accept that there is some risk attached to their activities. If one cannot control a risk through a business practices or transfer that risk to someone else through an indemnification clause, then he can manage that risk through insurance [Ratterman, 2003]. Some risks have enormous size in financial terms and the party to whom a risk is allocated may want to cover it by means of insurance [Akbiyikli, 2012].

Construction project parties, whether they are the owner, contractor, engineer or supplier, can protect their interests by insurance but must accept that not all risks are insurable [ERA-SMEC, 2008]. Insurance is not the only means by which risks associated with construction and infrastructure projects may be addressed, however, it is one of the principal means by which parties to major projects treat risk [Baartz, 2003].

Construction insurance is a practice of exchanging a contingent claim for a fixed payment to protect the interests of parties involved in a construction project and it plays an increasingly important role in guaranteeing the success of projects, with insurers sharing losses resulting from natural disasters and other contingencies [Akbiyikli, 2012].

## **2.4.2. Definition and Principles of Insurance**

### **2.4.2.1. Definition of Insurance**

Scholars and writers have given various definitions of insurance from different perspectives such as economic, social, legal, etc.

Anderson [2005] defined insurance as an agreement where, for a stipulated payment called the premium, one party (the insurer) agrees to pay to the other (the policyholder or his designated beneficiary) a defined amount (the claim payment or benefit) upon the occurrence of a specific loss.

Insurance is a social device, in which a group of individuals (called “insured”) transfer risk to another party (called the “insurer”) in order to combine loss experience, which permits statistical prediction of losses and provides for payment of losses from fund contributed (premiums) by all members who transferred risk [Pritchett, 1996].

Article 654(2) of the Commercial Code of Ethiopia [1960] provides a legal definition of insurance as follows:

An insurance policy is a contract whereby a person, called the insurer, undertakes against payment of one or more premiums to pay to a person, called the beneficiary, a sum of money where a specified risk materializes.

In construction contract perspective construction insurance can be defined as a contract whereby the insurance company seeks to provide coverage and indemnify the construction contractor or the client against a potential peril, loss, damage, or liability that arises from the performance of the construction work [Eschemuller, 2009].

### **2.4.2.2. Principles of Insurance**

Due to the specific nature of insurance agreements and construction insurance is no exception; certain legal rules apply, irrespective of the jurisdiction where the agreement is made [Bunni, 2003]. These rules can be distinguished throughout the wording of the three documents associated with such an agreement, namely: the proposal form, the policy and any endorsement issued, either with the policy or subsequently.

Generally accepted insurance rules are summarized as follows:

**1. Utmost good faith contract:** When insurance is transacted, the purchaser of insurance makes a proposal to the insurer, sometime by the completion of a 'proposal form', designed by the insurer for the specific perils to be insured and in which the proposer is expected to answer specific questions about these perils. Unlike the purchaser of ordinary goods, who is under no obligation to give any information to the seller, the purchaser of insurance must furnish to the insurance company any information it requires and volunteer any further facts relating to the risks for which cover is being sought.

According to Gould (2003), the majority of the disputes in the area of good faith relate to material facts which may affect the risk and may be classified as;

- Physical facts – concerning the likelihood of loss or the degree of loss; or
- Moral hazards – concerning whether the insured is a fit person to insure, because for example, the insured has a criminal record for dishonesty.

Article 668 of the Commercial code of Ethiopia with regard to utmost good faith contract states that the policy shall be of no effect where the beneficiary intentionally concealed facts or made false statements and such concealment or false statements cause the insurer wrongly to appreciate the risks to be insured so that, had he been aware of the truth, the insurer would not have entered into the policy or would have imposed terms less favorable to the beneficiary. The insurer shall retain all premiums paid.

**2. No financial profit:** The insurance contract invariably includes a statement establishing and clarifying the basis of claim settlement. As a contract of indemnity, the insurance policy is intended to place the insured, after a loss event covered by it, in the same financial position as that which existed immediately prior to the event. Therefore, except in limited circumstances, profit is not allowed as a result of an insured event and it is generally accepted that to allow profit would be against the interest of society [Bunni, 2003].

Article 665 and Article 678 of the Commercial code of Ethiopia states that the insured receives to the extent of the insured amount as depicted below:

Article 665

*(2) The insurer's liability shall not exceed the amount specified in the policy.*

Article 678

*A contract for the insurance of an object is a contract for compensation. The*

*compensation shall not exceed the value of the object insured on the day of the occurrence.*

Hence, an insured can only recover the actual loss that he is able to prove and is not allowed to make a profit.

**3. Insurable interests:** A fundamental requirement of insurance law is that the insured must have an insurable interest in the subject matter of the insurance. An insurable interest is an interest which is recognized and enforceable at law. It may be legal or equitable, a proprietary right or a contractual right.

According to Gould [2003], an insurable interest is not required under general contract law, but it is necessary under insurance because:

- Of a statutory requirement; and/or
- It is inherent in the nature of the contract of insurance (e.g. indemnity insurance).

The insured subject matter must bear some recognized relationship to the insured party and this relationship must be such that a benefit continues to accrue as long as the insured subject matter is free from injury [Bunni, 2003].

**4. Subrogation:** Subrogation is the complimentary principle of indemnity. It arises from two principles of common law. First, an insurer cannot avoid liability on the basis that the insured has a right to claim against some third party. Secondly, a third party cannot avoid liability to an insured on the ground that the insured will be indemnified for the loss by way of insurance.

As indicated by Gould [2003], the principle of subrogation provides the insurer with two benefits:

- To stand in the shoes of the insured and avail himself of all the rights and remedies available to the insured against the third parties and the action by the insurer is brought in the insured's name and the third party can raise any defenses which would have been available against the insured; and
- To recover from the insured any benefit received by the insured from third parties which reduces the loss covered by the insurance.

However, the insurer can only exercise a right of subrogation when:

- The insurance is indemnity insurance;
- The insurer has made payment under the policy, unless the policy provides

otherwise.

- The policy does not exclude the rights of subrogation as it may be possible to exclude subrogation from the policy for an additional premium.

Article 683(1) of the Commercial code of Ethiopia states the right of subrogation of the insurer as:

*(1) The insurer who has paid the agreed compensation shall substitute himself to the extent of the amount paid by him for the beneficiary for the purpose of claiming against third parties who caused the damage.*

**5. Contribution:** If an insured subject matter is covered against a peril for the benefit of an insured party by more than one policy, and if that peril eventuates into a loss, the insured cannot recover from more than one insurer. In that event, an insurer, having paid a claim, can seek a contribution from other insurers liable for the same loss to contribute towards the payment made [Bunni, 2003].

According to Gould [2003], in order for an insurer to exercise this right the insurance policy must:

- Cover the particular event;
- Cover the same subject matter; and
- Contain no provision stating that the policy only applies after other insurances have been exhausted.

Article 681 of the Commercial code of Ethiopia states the right of contribution of the insurer as:

*(1) Where several insurers insure the same object against the same risk so that the object is over insured, each insurer may, where there has been fraud on the part of the beneficiary, require the termination of the policy and may in addition claim damages.*

*(2) Where the beneficiary is in good faith, each insurer shall, where the risk materializes, pay compensation in proportion to the value insured by him.*

**6. Proximate cause:** The principle of proximate cause is implied into contracts of insurance and requires the insured to show that the loss was caused by an insured peril. Proximate cause means the effect of the common, dominant or real cause of the loss and will be a question of facts in each case. The principle may of course be modified or even excluded by the contract [Gould, 2003].

**7. Warranties:** A warranty is a term of the insurance policy which if broken entitles the insurer to terminate the contract from the time of the breach regardless of whether the breach is material. In the law of insurance the term “warranty” is therefore used in a similar sense to that more readily associated in general contract law with the term “condition”. Breach of a warranty justifies the injured party’s refusal to further performance [Gould, 2003].

**8. Fortuity:** the principle of fortuity is fundamental to the basic concept of insurance and the grant of coverage. Insurance responds to risk, rather than losses that were planned, intended or anticipated by the insured [Karen, 2011]. The term “Fortuitous” means accidental, unintentional or unexpected.

The necessity of fortuity seems to spring from recognition that insurance contracts are commercial transactions. It is thus presumed that the insurer and the insured would both intended to conclude a commercially sensible arrangement. Providing insurance coverage to non-fortuitous damage or injury is contrary to public policy because it allows for potential profit from wrongdoing and eliminates the deterrent effect of financial responsibility. It also shifts the burden of loss from the intentional wrong-doer to other, innocent insured’s who are forced to pay higher premium.

Article 663(3) of the Commercial code of Ethiopia confirms that intentional damages are not covered in insurance policy as:

*(3) Notwithstanding any provision to the contrary, risks arising out of the intentional default of the beneficiary shall not be covered by the insurance.*

Thus, an insurer is expected, when dealing with construction insurance, to understand the intricate and complex problems of building, construction, engineering, and mathematics in the form of quality measurements, probability and statistical calculations, economics, law and all aspects of insurance. He is also required to contrive means of providing cover against the perils of construction in an effective and efficient manner while at the same time achieving a profitable transaction.

Furthermore, it is expected that all parties involved in construction insurance should act in unison to provide correct allocation of risks and responsibilities, which must be reflected in the contractual agreements. These agreements must also encompass the allocation of liabilities and how they are to be dealt with, if they arise. The provision of indemnity must be

considered and, if required, the shift towards insurance should be carried out with the minimum of gaps (sufficiency of cover) and overlaps (expenses).

### **2.4.3. Insurability and Uninsurability of Risks**

#### **2.4.3.1. The Insurability of Risks**

Insurable risk means a risk, which can be covered by insurance. Not all risks are insurable and while the principle of the equitable contribution of many for the benefit of an individual suffering a loss is the cornerstone of insurance philosophy, certain limitations must be put on that principle to make the insurance transaction viable [Bunni, 2003].

For a risk to be acceptable by an insurer it has to be a “pure risk” which means it has the down side of the effect only (opportunity for loss only); speculative risks are not covered by traditional insurance. Moreover, it has to be sudden and accidental, with statistics available for insurers to simulate past events and generate a creditable premium [Junying, 2006].

Insurable risks are defined by FIDIC and CII together as follows [FIDIC, 1986]:

1. The principle of insurance is based on the theory of probability and, therefore, there must be an element of uncertainty relating to the matter to be insured, i.e. accidental or fortuitous in character.
2. An insurable risk should preferably be measurable in quantitative terms and in such a way that the theories of probability and the law of large numbers may be used. Without this stipulation, the premium required to insure the risk could not be scientifically calculated. Insurance becomes lottery in the absence of such calculations. It is, however, important to note that, if the extent of the risk is unquantifiable, it is the assessment of the premium and not the insurability that is in question.
3. An insurable risk should preferably be such that it is acceptable to the insurance market through appropriate risk selection methods. The objects insured must be numerous enough and homogeneous enough to allow sufficient selection.
4. An insurable risk should preferably be such that one can determine whether loss has in fact occurred and the cause of the resultant damage. The extent of the damage should also be capable of assessment.

As suggested by Baartz [2003], whether insurance can be used as a solution depends on:

- The insurability of the risk;

- The adequate and tailored policy;
- The comparison of the insurance premium and the potential loss of risks;
- The trust and confidence of insurers about their solvency and claim service; and
- No other alternative risk transfer solutions available.

#### **2.4.3.2 The Uninsurability of Risks**

The insurance industry as a whole is increasingly confronted with risks where for reasons of principle and capacity doubts as to whether they can or should cover. This increase of risks at the limit of insurability is due to social and accumulated problems, advancing technology and concentration of values, increased complexity and exposure of numerous risks [Berliner, 1985].

It is important to note that the responsibility and liability for damage to property and/or personal injury emanating from uninsurable risks must be clearly defined in any contract. Bunni [2003] classified uninsurable risks with four categories as outlined hereunder:

- 1. *Foreseeable risks:*** An insurer will argue that if a contractor stores cement in an uncovered condition during a rainy season, then any damage caused is foreseen to be inevitable and, thus, is not the liability of the insurer. On the other hand, if the cement was stored in a watertight shed and the roof of the shed blows away under severe wind, then the contractor will argue that this is unforeseen damage.
- 2. *Unquantifiable risks:*** A consequential economic risk is unquantifiable, even in a certain circumstance. It is, therefore, very rarely covered. However, the word ‘consequential’ must not be confused with ‘consequence’ as in risks resulting as a consequence of defective design, material and/or workmanship because these risks are quantifiable and their limit is the value of the contract which is insured. Such damage resulting from, or occurring as a consequence of these defects is insurable and the intention of a good insurer must always be clear in this respect. Insurance policies must be written in clear and precise language at all times but more especially so when dealing with this issue because, otherwise, it could result in a dispute if repair to a resultant damage is costly.
- 3. *Political risks and risks on an international scale:*** War is a good example of these risks that are normally uninsurable. The reason is that the principle of the contribution

of many for the benefit of an individual suffering loss breaks down in such a situation, unless governmental institutions carry out the insurance.

**4. Causation:** To prove the cause of any damage on a project is to establish the responsibility and liability for it and to establish whether or not the damage is covered through the provisions of the insurance contract. If such a cause cannot be proven for any particular risk, the risk becomes uninsurable.

#### 2.4.4. Types of Construction Insurances

Construction insurance encompasses all contracts of indemnity within the activities of the construction industry where insurance is chosen as the medium through which liabilities are shifted. It involves not only many branches of insurance but also many disciplines and professions [Bunni, 2003]. Construction insurance is a practice of exchanging a contingent claim for a fixed payment to protect the interests of parties involved in a construction project and it is a major method of managing risks in the construction industry [Akbiyikli, 2012].

The primary function of construction insurance is to transfer certain risks from clients, contractors, subcontractors and other parties involved in the construction project to insurers to provide contingent funding in time of difficulty. Construction insurance plays an increasingly important role in guaranteeing the success of projects, with insurers sharing losses resulting from natural disasters and other contingencies.

Most construction insurance products currently on the market can be divided into two categories: property insurance and liability insurance [Bunni 2003]. Table 2.1 shows insurance policies usually issued for each party in connection with construction.

Table 2.1 Typical Insurances on a Construction Project: *Source Bunni [2003]*

| Professional Team       | Owner                                                                                                                                    | Contractor              |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Liability Insurance     | Liability Insurance                                                                                                                      | Liability Insurance     |
| 1. Employer's Liability | 1. Employer's Liability                                                                                                                  | 1. Employer's Liability |
| 2. Public Liability     | 2. Public Liability for limits in excess of that stipulated in the contract or in respect of liability not indemnified by the Contractor | 2. Public Liability     |

|                           |                                                                                           |                                                                        |
|---------------------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 3. Professional Indemnity | 3. Public Liability for Non-negligence                                                    | 3. Public Liability for Non-negligence                                 |
|                           | <b>Property Insurance</b>                                                                 |                                                                        |
|                           | 4. Insurance for any part of the works taken over or used or occupied prior to completion | 4. Professional Indemnity, if design work is carried out by Contractor |
|                           | <b>Decennial Insurance</b>                                                                | <b>Property Insurance</b>                                              |
|                           | 5. Decennial cover policy                                                                 | 5. Contractors All Risks                                               |
|                           |                                                                                           | <b>Marine Insurance</b>                                                |
|                           |                                                                                           | 6. Marine Transport policy                                             |
|                           |                                                                                           | <b>Other Transport Insurance</b>                                       |
|                           |                                                                                           | 7. Motor Insurance                                                     |

#### 2.4.4.1. Property Insurance

This insurance mainly provides protection to the works and any material, equipment and machinery connected with it. It is generally transacted through what has become known as Contractors' All Risks Insurance Policy or Erection All Risks Insurance Policy. Despite the All Risks tag on the policy, the insurance cover in either of these two policies excludes a number of risks and has a long list of conditions that must be met.

In general, however, unless a risk is specifically excluded from the policy, it is considered to be included in the cover provided (Bunni, 2003).

Table 2.2: Property Insurance and Liability Insurance: *Source Bunni [2003]*

| Type of Insurance          | Coverage                                                                                                                                                                                 | Transaction                                                                                                                                                                                                                       |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Property Insurance</b>  | Provide protection to the works and any material, equipment and machinery connected with it                                                                                              | Transacted through:<br>• Contractors' All Risks Insurance Policy<br>• Erection All Risks Insurance Policy                                                                                                                         |
| <b>Liability Insurance</b> | Provide protection to the insured party against specific legal liabilities to which he may become exposed as a result of activities culminating in bodily injury and/or property damage. | Transacted through:<br>• Employer's Liability: towards employees<br>• Public Liability: towards third parties who are not partly to the insurance contract<br>• Professional Indemnity Insurance: towards the design professional |

In the case of Ethiopia, property insurance is regulated in the Commercial Code of Ethiopia [1960] under Article 654(2) to Article 675.

The Commercial Code of Ethiopia [1960] under Article 654(2) states that

*(2) Where damages are insured, the insurance policy shall extend to the risks affecting property or arising out of the civil liability.*

To illustrate some of the property insurances commonly issued are;

- (Private) Property Fire Insurance;
- Burglary Insurance;
- Contractor's All Risk Insurance;

#### **2.4.4.2. Liability Insurance**

Under a liability insurance policy, an insurer undertakes that, if the insured person (the client) becomes legally liable to someone else (the 'victim'), the insurer will indemnify the client against damages and legal costs which become payable [Hughes, 2000]. Liability insurance is intended to provide protection to the insured party against specific legal liabilities to which he may become exposed as a result of activities culminating in bodily injury and/or property damage [Bunni, 2003].

The legal liabilities may be towards employees, in which case Employers' Liability Insurance would apply, or towards third parties who are not partly to the insurance contract, in which case Public Liability Insurance would apply. In the case of the design professional, legal liabilities incurred in the course of his professional work are covered under Professional Indemnity Insurance [Hughes, 2000].

Generally speaking, legal liabilities are incurred as a result of negligence and lack of care [Bunni, 2003]. However, in certain circumstances, insurance is required even when negligence has not been committed. Such insurance is also transacted within the liability type of insurance.

Liability insurance under the Commercial Code of Ethiopia [1960] is discussed under Article 654(2) to Article 685. To illustrate some of the Liability insurances commonly issued are;

- Compulsory (Liability) Motor Insurance; (in case of car accident or collision on road);
- Employer's Liability Insurance; (to compensate the employer in case of the

worker's negligence who injures third party ); see also Article 2130 of the Civil Code;

- Professional Liability Insurance/Professional Indemnity Insurance;(in case of Engineer's or Architect's liability towards its client); and
- Workmen's Compensation Policy; (to cover the liability of the employer to the worker as per the Labour Law).

Liability under the Ethiopian law is further extended to Extra-contractual liability that emanates from the law in addition to the contractual liability that concerns about the specific individual with whom we have a contractual relationship.

The Extra-contractual liability concerns about the general public or to any third party. With respect to the construction project or the construction business there may be a practical possibility to become extra-contractually or legally liable towards third parties, with whom we do not have any contractual relationship.

The Law of Extra-contractual liability is provided under the Civil Code of Ethiopia from Article 2027 to Article 2161 (Title XIII Chapter I).

According to Article 2027 of the Civil Code of Ethiopia [1960], there are three sources of extra-contractual liability. These are:

- Liability based on fault ( Article 2027(1));
- Liability without fault ( strict liability) ( Article 2027 (2)); and
- Liability for others ( vicarious liability) ( Article 2027(3);

#### **a) Professional Indemnity Insurance**

As its name suggests, this insurance indemnifies an insured for amounts which the insured becomes legally liable to pay as a result of any actual or alleged negligent act, error or omission in the conduct of its business or profession [Baartz, 2003]. According to Bunni [2003], professional liability claims may arise from any of the risks involved in such hazards as a consequence of:

- (a) The standard that society expects from the professions;
- (b) The personality of the design professional and his relationship with the owner and the contractor;

- (c) The unique features of the construction contract;
- (d) Lack of communication and other sources of mistakes, errors, omissions, breaches of professional duty and other such reasons which lie behind litigation in construction.

Professional indemnity insurance (PII) covers professionals, such as architects, engineers and other consultants, and claims against them arising out of the professional services they provide [CACC, 2004]. Typically the cover includes, and claims may arise from the services involved where they include:

- A breach of professional duty;
- Negligence;
- Bodily injury and property damage arising from service negligence;
- Fraud/dishonesty other than a company director's dishonesty;
- Infringement of intellectual property;
- Breach of duty/confidentiality;
- Defamation; and
- Loss of documents.

Professional indemnity insurance policies are written on claims made basis, in contrast to many other types of insurance. This means that the insurers who pay the claim are those providing cover when the claim, or circumstances which might give rise to a claim, is first notified to insurers, rather than when the work was undertaken or the mistake made [CIC, 2008]. This means that they cover claims actually made against the professional person during the period of insurance, regardless of when the negligent act took place.

As a result, it is essential that insurance cover is maintained, even after the retirement or death of the professional concerned, and this can usually be arranged on a single-premium 'run off' basis [Hughes, 2000].

There are two methods of assessing the extent of professional indemnity insurance cover. The first is a *Simplified Method* that applies for conventional consultancies not related to construction. The simple approach is to base the level of cover on the fee to be paid. The more comprehensive approach is the *Risk Assessment Based Method* which addresses the particular risks associated with the type and nature of the professional service involved.

## **b) Decennial Insurance**

After the works have been completed, defects remedied and finally accepted by the employer, there may be no contractual liability towards the contractor except the outstanding ones. There might, however, be a possibility for legal liability. This is the warranty obligation of the contractor. This legal warranty period lasts for ten years and the ten year time is calculated from the date of the final acceptance of the works [Baartz, 2003].

Decennial insurance is generally transacted to cover the liability of those involved in construction for latent defects in the stability of the structure and for major defects in the weather shield for ten years. The ten-year cover matches the limitation period in respect of the stability and major defects in the structure or of an important part thereof in certain jurisdictions [Bunni, 2003].

A guide designed for European builders on decennial insurance stated that the policy covers material damages of obvious severity, irrespective of cause and origin, which did not become manifest by the date of acceptance of work, and which appear within the ten-year period. The damages must be beyond doubt, with the consequence that:

- Building solidity is compromised
- The building is rendered unsuitable for its purposes.

Such liability is called decennial liability and exists mainly in jurisdictions where the civil code forms the basis of the legal system which is a case for Ethiopia. Article 3039 (Warranty due by the Contractor) of the Civil Code of Ethiopia [1960] (under Contracts of Work and Labour related to Immovable) for private construction contract states;

(1) The contractor shall guarantee during ten years from its delivery the proper execution and the solidity of the work done by him.

(2) He shall be liable during this period for such loss or deterioration of the work as is due to a defect in its execution or to the nature of the soil on which the work has been done.

(3) Any provision shortening the period laid down in sub-art (1) or excluding the warranty due by the contractor shall be of no effect.

On the other hand, for public construction Article 3282 of the Civil Code is applicable and more relevant. It applies for public works like road works by ERA as per the concept of the Law of Administrative Contract of the Civil Code of Ethiopia as it states;

(1) Unless otherwise provided, the contractor shall be liable to the administrative authorities

for the defects of construction of the works during ten years from the day on which they have entered into possession of works.

(2) The warranty shall not be due, however, in respect of the defects which were apparent at the time of the final acceptance of the works.

(3) The warranty shall apply to such defects only as prevent the work from being used for the purpose mentioned in the contract or as render such use more onerous or less profitable.

### **c) Bonds and Guarantees**

A bond or guarantee is an arrangement under which the performance of a contractual duty owed by one person (A) to another (B) is backed up by a third party (C) [Hughes, 2000]. Bonds and guarantees are not insurance policies and there are fundamental differences between the two, the most important of which is the fact that an insurance policy is a contract between two parties whereby the insured pays a premium to the insurer for the privilege of transferring the obligations, in respect of certain risks, to him. The bond is not a contract by itself since it rests on a latent contractual obligation between two parties [Bunni, 2003]. The surety acting for one party against a fee will, in the event of non-performance by that party, step in and fulfill the obligation.

There are six main forms of bond and guarantee transacted within the construction industry. They are issued in the format that the issuer will pay an agreed sum when the beneficiary states that default had occurred. These are enumerated below:

**1. Bid bonds:** Bid bonds are intended to assure the beneficiary that the bid or tender is a serious one and that, if it is accepted, the tenderer will proceed and effect the form of contract including whatever subsequent bonding arrangements he is required to provide.

**2. Performance bonds:** Performance or supply bonds are issued for the completion of the contract. Unless it is specifically stated, the bond is issued for the completion of the contract and not for its proper completion. This is the reason why keeping the bond beyond the contract period is of no value to the owner, unless the usual format of bond is changed to include the word ‘proper’, or such similar phraseology to incorporate the standard of performance into the bond. If it happens, however, that the contractor becomes insolvent during the construction period and it is then discovered that defective material and workmanship has been incorporated in the works, the cost of removing that work and replacing it with proper work

comes within the responsibility of the insurer under the bond and subject to its limits.

**3. Advance payment guarantees:** These guarantees are issued to assure the beneficiary that any sums of money advanced will not be lost through default or poor performance by the party in receipt of the advance.

**4. Retention money bonds:** This type of bond is issued to allow the release of retention money usually held by the beneficiary.

**5. Maintenance bonds:** Maintenance bonds are issued to guarantee that as soon as the installation is completed, the contractor will fulfill his obligations throughout the commissioning and testing periods.

**6. Company suretyship:** This type of surety is transacted when a party acts as a guarantor for another in the lease purchase of equipment or similar. This transaction is extremely perilous for the surety since the beneficiary in this case is normally a finance company which has perfected a standard form of agreement in which the guarantee is made effective in respect of past and future transactions, irrespective of whether or not the surety is made aware of them.

The type of bond normally found in the construction industry is the conditional bond, under which the surety agrees to pay if and when certain specified conditions are satisfied. In the case of a performance bond, the most likely such condition would be any default (i.e. Breach of contract) by the contractor. In order to call for payment, the employer must provide evidence of both the contractor's default and the resulting losses suffered by the employer [Hughes, 2000]. Conditional bonds are sometimes referred to as "default" or "proven default" bonds and are predicated on a breach of the underlying contract by the contractor [Norton, 2010].

A second type of bond is the unconditional or demand bond, something which has spread into the construction field from international trade [Hughes, 2000]. Such a bond entitles the beneficiary to call upon the surety for payment whether or not there has been default under the principal contract, provided only that the call is not fraudulent.

On-demand bonds are commonly used in international project finance and they are usually given by banks rather than insurance companies [Norton, 2010]. This means that, unless the surety has clear evidence of such fraud, payment must be made. The use of these bonds in

construction contracts is on the whole undesirable since, while the employer may not intend to call on such bonds irresponsibly, the contractor cannot rely on this; the contractor must therefore increase the tender price to cover the cost of something which is not really necessary [Hughes, 2000].

#### **2.4.5. Role of Insurance for the Construction Industry**

In the construction industry, insurance is one of the most important ways to tackle risk. In fact, insurance is considered as a synonym for risk management in the industry [Pankaj, 2013]. The majority of construction companies rely on insurance policies for different risk scenarios. They purchase a number of insurance policies depending on the project and contractual requirement.

Most standard forms of engineering and construction contracts require the contractor to effect a range of insurances and to extend such cover to subcontractors [Akbiyikli, 2012]. One of the primary functions of a construction contract is to allocate certain risks to one or other of the parties and in view of the enormous size of some of these risks in financial terms, it is obvious that the party to whom a risk is allocated may want to cover it by means of insurance [Hughes, 2000].

Due to the fact that different bodies are involved in a typical civil engineering projects (clients, consultants, contractors, sub-contractors, suppliers, employees, financiers, members of the public, etc.), it is important for everybody to be sure that insurance is given proper attention and covers the expected risks satisfactorily without paying for unnecessary cover or duplication of cover [Abebe, 2000].

Insurance is not a substitute for effective risk management. Insurance is only intended to deal with measurable or known risks and serves to spread the impact of loss [CIDB, 2004]. In considering whether or not insurance should be looked at as the answer to a particular identified risk, the following questions need to be considered [Baartz, 2003]:

- Is the risk insurable? - Can a policy be procured which specifically covers the risk?
- Is the cover adequate? - If a policy is procured, will it respond to the risk which you have identified and to the fullest extent of that risk?
- Does the cost outweigh the risk? - What is the cost of the policy?
- What is the nature of the policy? - How long will the policy operate to provide cover?
- Can the policy be tailored or negotiated?

- Is the insurer here for the long haul? – To what extent can the parties have confidence that the insurer is solvent and able to honor its contractual obligations if called upon?

It is important that contract administrators check insurance policies before work commences, and at other appropriate times, to ensure that the specified insurance is in place [CACC, 2004]. Most construction contracts contain a provision that before the contractor commences work under the contract and whenever requested in writing by the other party, a party liable to insure shall provide satisfactory evidence of such insurance effected and maintained [Baartz, 2003].

Contract administrators must be prepared to act decisively if insurance arrangements are unsatisfactory because lack of insurance can put at risk the whole value of the works, or expose the principal to large claims for personal injury or death. Contract actions in response to unsatisfactory insurance may include [CACC, 2004]:

- Terminating contracts,
- Denying contractors' access to sites,
- Suspending work, and
- Withholding payment of contractors' claims

However, if appropriate contract administration practices are not in place, there is a risk that a party required to maintain prescribed insurance under the contract may fail to comply with that obligation and an event occurs to which insurance would have responded had it been in place. In these circumstances, a party might have a claim in contract against the other but the party in default may not have the financial resources available to satisfy the claim [Baartz, 2003].

#### **2.4.6. Insurance Companies in Ethiopia**

Insurance service is fundamentally important both for the construction business and construction project, since there is an obvious and inherent element of risk in them. Despite the advancement of insurance as commercial business, it is little understood and exercised by the Ethiopian society in general and the construction industry in particular [Abebe, 2000].

The emergence of insurance business in Ethiopia was closely linked to expatriates and foreign insurance companies. There were a good number of foreign insurance companies undertaking insurance business in Ethiopia through agents prior to 1951. The first domestic insurance company, namely, Imperial Insurance Company of Ethiopia Ltd was established in 1951.

Thereafter, until 1960 one domestic and numerous foreign insurance companies represented by agents were operating insurance business in Ethiopia [Zelege, 2007].

Four distinct periods can be observed in the development of insurance in Ethiopia as indicated by Zelege [2007]:

- 1920s-1950s: this period can be designated as the period of agents of foreign insurance companies. There was only one domestic insurance company, which was established in 1951, that was undertaking insurance business in the 1950s. Competition during this period was believed to have taken place between the domestic firm and the foreign companies operating through agents.
- 1960-1975: this period can be cited as the era of private insurance companies. Fourteen (93%) of the 15 domestic insurance companies that existed prior to the enactment of the country's first insurance proclamation (1970) were established in 1960s.
- 1976-1994: this period reflects the era of monopoly. The state owned insurer, Ethiopian Insurance Corporation, monopolized the insurance business in the country.
- 1994-Present: private insurance companies re-emerged. Both the public and the private insurance sectors operate side by side.

Following the 1994 insurance proclamation, which brought to an end to the monopoly of the insurance business by the state owned insurer for 19 years, the private sector once again got an opportunity to engage in insurance business and a number of private insurance companies established. The first to be established in August 1994 was Universal Insurance, which was later closed down as a result of supervisory measures. Lion Insurance Company, which was established in October 1998, was merged with UNIC (United Insurance Company) in October 2000 [Zelege, 2007].

Currently, the Ethiopian insurance industry consists of 16 insurance companies (1 public and 15 private) as shown in Table 2.3 below:

Table 2.3: Ethiopian Insurance Companies; Source, website of the National Bank of Ethiopia: (<http://www.nbe.gov.et/aboutus/faq.html>) .

| No | Company Name                                | Date of Establishment |
|----|---------------------------------------------|-----------------------|
| 1  | Ethiopian Insurance Corporation             | 1975                  |
| 2  | National Insurance Company of Ethiopia S.C. | 23/09/1994            |
| 3  | Awash Insurance Company S.C                 | 1/10/1994             |
| 4  | Africa Insurance Company S.C                | 1/12/1994             |
| 5  | Nyala Insurance Company S.C                 | 6/1/1995              |
| 6  | Nile Insurance Company S.C                  | 11/4/1995             |
| 7  | Global Insurance Company S.C.               | 11/1/1997             |
| 8  | The United Insurance S.C                    | 1/4/1997              |
| 9  | NIB Insurance Company                       | 1/5/2002              |
| 10 | Lion Insurance Company S.C                  | 1/7/2007              |
| 11 | Ethio-Life and General Insurance S.C.       | 23/10/2008            |
| 12 | Oromia Insurance Company S.C.               | 26/01/2009            |
| 13 | Abay Insurance Company                      | 26/07/2010            |
| 14 | Berhan Insurance S.C.                       | 24/05/2011            |
| 15 | Tsehay Insurance S.C.                       | 28/03/2012            |
| 16 | Lucy Insurance S.C.                         | 13/11/ 2012           |

In the Ethiopian insurance industry, all local insurance companies are transacting with foreign reinsurance companies, thus transferring part of the risk they undertake against payment of part of the premium originally charged [Zelege, 2007].

The reinsurance transaction can be both a one-off arrangement, known as facultative reinsurance, or an automatic arrangement with an agreed pattern for a specific branch of insurance under a contract between the insurer and reinsurers usually referred to as a reinsurance treaty (Bunni, 2003). According to Zelege [2007], the reinsurer companies giving reinsurance to the Ethiopian insurance companies are from different countries including: Germany, Kenya, Nigeria, PTA, Tunisia, India, South Africa, Morocco, Mauritius, and Turkey.

In the case of the relationship between the reinsurer and the insured, it is important to note the fact that insurance company buys reinsurance gives no rights to the insured so that if the insurer fails or refuses to perform his obligations to his insured, the insured has no right of action against the reinsurer [Bunni, 2003]. In this regard, establishment of reinsurers in the country is advantages to the policyholder and the country in saving the foreign currency that is

being paid by insurance companies for the transaction of reinsurance service and the performance of the insurance business.

At the moment, there is no locally established reinsurance company in Ethiopia that needs the government and insurance stakeholder's attention. Recently, however, there is a government plan to establish a local re-insurance company in Ethiopia. The establishment of re-insurance companies in Ethiopia may be so important to the construction industry due to its capital intensive nature.

#### **2.4.7. Regulation and Supervision of Insurance Industry in Ethiopia**

It is common in most countries of the world to observe government interventions to regulate and supervise the insurance industry to protect the interest of policy holder/insured and to ensure a stable financial sector since insurance companies are part of the overall economy in a given country.

Insurance regulation refers to the legal framework and statutes within which insurance companies operate in a country and supervision of insurance company also refers to the continuous monitoring of insurance companies to ensure that they are operating in accordance with the insurance proclamation and regulations issued [Zelege, 2007].

Though both domestic and foreign insurance companies had been undertaking insurance business in Ethiopia prior to 1960, there were no insurance laws put in place until the issuance of the Commercial Code and the Maritime Code in 1960. Following that various regulations were issued to regulate the insurance business in the country.

In line with Proclamation No. 746/2012 (Insurance Business Proclamation), the National Bank of Ethiopia has the powers and duties as stated in the proclamation including:

- Licensing insurance companies and insurance auxiliaries ;
- Conducting continual on-site and off-site supervision and monitoring;
- Taking intervention measures, depending on the findings of supervision and monitoring;
- Ensuring the existence of sound and stable insurance industry ;and
- Protection of the interests of policyholders.

#### **2.4.8. Summary**

All parties involved in a construction project must accept that there is some risk attached to their activities. If one cannot control a risk through business practices or transfer that risk to someone else through an indemnification clause, then he can manage that risk through insurance [Ratterman, 2003]. Though construction project parties, whether they are the owner, contractor, engineer or supplier, can protect their interests by insurance; but they must accept that not all risks are insurable [ERA-SMEC, 2008].

Construction insurance is a practice of exchanging a contingent claim for a fixed payment to protect the interests of parties involved in a construction project and it plays an increasingly important role in guaranteeing the success of projects, with insurers sharing losses resulting from natural disasters and other contingencies [Akbiyikli, 2012].

Due to the specific nature of insurance agreements; certain legal rules apply, irrespective of the jurisdiction where the agreement is made [Bunni, 2003]. These rules can be distinguished throughout the wording of the three documents associated with such an agreement, namely: the proposal form, the policy and any endorsement issued, either with the policy or subsequently. These rules are: utmost good faith contract; no financial profit; insurable interests; subrogation; contribution; proximate cause; warranties and fortuity.

For a risk to be acceptable by an insurer it has to be a “pure risk” which means it has the downside of the effect only (opportunity for loss only); speculative risks are not covered by traditional insurance. Moreover, it has to be sudden and accidental, with statistics available for insurers to simulate past events and generate a creditable premium [Junying, 2006]. In addition, risk management system and nature of risks have a significant impact on the insurance premium to be requested by insurers. Insured’s strong and deep interest in potential risk management development encourages insurers to offer substantial added value, which assists the insured to manage risks. Construction insurers’ opportunity lies in having skilled staff available and adequate resources to be able to perform an expert service in insurance and risk management.

The insurance industry as a whole is increasingly confronted with risks where for reasons of principle and capacity doubts as to whether they can or should cover. This increase of risks at the limit of insurability is due to social and accumulated problems, advancing technology and concentration of values, increased complexity and exposure of numerous risks [Berliner,

1985]. In this respect, construction contract parties should be innovative and have the ability to negotiate with the insurers improved conditions of insurance, which are adapted to the changed needs as well as obtain best premium reduction through implementing proper loss control and risk management measures by involving their experienced expert team. While contractors are mainly responsible for successful risk management of projects, insurers can provide their expertise to assist the contractors' risk management in recognizing potential risks and reducing the probability of such risks.

Bunni [2003] classified uninsurable risks with four categories as outlined here: foreseeable risks; unquantifiable risks; political risks and risks on an international scale and causation. In order to examine the insurability or uninsurability of risks in the Ethiopian road construction industry, 50 construction risk factors are identified to evaluate the practice of parties involved in the road construction sector in applying the principles of insurance when they interact with insurance companies.

After risks are qualified for insurability, then the selection of the appropriate insurance policy comes to picture that requires proper evaluation of the available insurance products in the market. Most construction insurance products currently on the market can be divided into two categories: property insurance and liability insurance. Property insurance mainly provides protection to the works and any material, equipment and machinery connected with it. It is generally transacted through what has become known as Contractors' All Risks Insurance Policy or Erection All Risks Insurance Policy.

Under a liability insurance policy, liabilities may be towards employees, in which case Employers' Liability Insurance would apply, or towards third parties who are not partly to the insurance contract, in which case Public Liability Insurance would apply. In the case of the design professional, legal liabilities incurred in the course of his professional work are covered under Professional Indemnity Insurance [Hughes, 2000]. Hence, Construction insurance can cover the interest of clients, financiers, contractors, subcontractors, architects, engineers and suppliers.

In line with the above major classification, list of insurance policies commonly transacted are identified through intensive literature review from an international practice and subsequently, the practice of the Federal road projects parties (client, contractor, consultant and insurance companies) in the utilization of these insurance policies have been examined through systematically arranged questionnaires.

## CHAPTER THREE

### RESEARCH DESIGN AND METHODOLOGY

#### 3.1. Introduction

This section describes all the procedures that were undertaken to achieve the objectives set for this study. The procedures that were adopted including all the information relevant to the collection of the data, where those data were obtained and how they were obtained are discussed. In addition data and information sources, research instruments, sample size and method of analysis are presented.

The succeeding section provides a general description of the research strategy adopted for this thesis, as well as justification of the methodology.

#### 3.2. Research Design

There are two types of research strategies namely: quantitative research and qualitative research. The main criteria to decide on which type of research to follow depend on the type of study and availability of the information which is required for the study [Naoum, 1998]. Quantitative research is an objective measurement of a problem based on a theory composed of variables that can be measured in numbers; whereas, qualitative research emphasizes meanings, experiences and descriptions to subjectively evaluate the opinion, view or perception of respondents towards a particular issue.

In consideration of the nature of the research question, qualitative research method is selected for this study as the research questions relates to the personnel attitude, opinion and view. Hence, in line with the above the research was carried out using a three phase approach in order to achieve the aims and objectives of the research.

The first was to undertake a literature search on previous publications on risk management especially insurance as a major risk transfer tool in the construction industry. The literature review was carried out throughout the whole research project, this was to compile and discuss information on insurance as a major risk transfer tool in construction in order to have an in-depth study, and to establish current theory on the use of insurance in construction. Many literature sources were used as primary, secondary and references

such as academics periodicals, research journals, archival documents within the Ethiopian Roads Authority, dictionaries, past dissertations and Internet resources.

In the second phase, questionnaires were developed to address the research objectives and the questionnaires were in three main parts in order of sequence as follows:

- (a) The first set of questions was to categorize respondents to different parties in the road construction industry. That is to classify them under the role of client, consultants, contractor as well as insurers. The purpose was to determine the answers they provide based on the role they play during the risk management and insurance.
- (b) Background information – collecting the personal data of respondents, their experience in the road construction industry.
- (c) General perception of risk management and insurance – collecting the respondents' familiarity with the concept of risk management and insurance practices in the Ethiopian Federal road construction projects. The set of questions under the section was to ask respondents on the following:
  - To identify major risks factors in the Ethiopian Federal road construction industry;
  - To identify insurable risks and the types of insurance policies mostly used in the road construction industry; and
  - To identify the role of insurance as a means of managing risks;

Finally, the results of the questionnaires were analyzed using statistical techniques and the results used to form basis for recommendations as well as areas for further research. The methods of analysis used in analyzing the data were: Relative Importance Index (RII) and Weighted Average.

### **3.3. Data Collection**

#### **3.3.1. Primary Data**

The source of the primary data will be in a form of questionnaire, designed to gather a large volume of data from client (ERA), consultants, contractors and insurance companies. The primary function of the survey is to collect information that can be analyzed, and inference made to produce conclusion about major risk factors in the road construction industry, the use of insurance as a risk transfer tool in the construction industry and the interactions between

construction parties and insurance companies with respect to risk management.

### **3.3.2. Secondary Data**

Secondary data which involves information from published text such as academics periodicals, research journals, government publications, dictionaries, past dissertations and Internet resources were used to compliment the primary data.

### **3.3.3. Sampling**

The questionnaires were sent to reputable professionals selected from contractors, client/ERA, consultants and insurance companies that are considered familiar to the road construction industry in Ethiopia.

## CHAPTER FOUR

### ANALYSIS AND DISCUSSION OF RESULTS

#### 4.1. Introduction

A total of 59 questionnaires were sent to a selected sample of respondents in the Federal road construction industry which comprise the following: 12 client (ERA), 14 consultants, 16 insurance companies and 17 contractors. Sample of the questionnaires are attached in Appendix 5. The questionnaires were sent to key stakeholders in the road construction industry that are considered to have direct relation with the objectives of the research. These include client (ERA), consultants, insurance companies and contractors.

#### 4.2. Analysis of Response

A total of 59 questionnaires were sent to the four groups of respondents in the road construction industry. Out of 59 questionnaires, 45 questionnaires were collected which comprises 10 from client (ERA), 10 from consultants, 13 from insurance firms and 12 from contractors. This gives a response rate of 76.3% as shown in Table 4.1 below the breakdown of responses from the various sample groups.

##### 4.2.1. The Client (ERA)

A total of 12 questionnaires were sent out to the client (ERA) to its various departments that are involved in road construction contract administration including the Design and Build Directorate out of which 10 questionnaires were collected. This represents 83.3% of the total number of questionnaires sent out to the client.

##### 4.2.2. The Consultants

Out of a total of 14 questionnaires sent out to the consultants; 10 questionnaires were received and considered valid for analysis. This represents 71.4% of the total number of questionnaires sent out to the consultants.

##### 4.2.3. Insurance Companies

A total of 16 questionnaires were sent out to the Insurance companies. Out of which 13 questionnaires were completed and returned. This represents 81.3% of the total number of

questionnaires sent out to the insurance companies.

#### 4.2.4. The Contractors

Out of a total of 17 questionnaires sent out to grade one foreign and local contractors, 12 questionnaires, and representing 70.6% were returned and found to be valid.

An overall response rate of 76.3% was achieved. This is significant for the purpose of validating the research results. The respondents were generally slow in responding to the questionnaires but all were compiled within a reasonable time space. Table 4.1 shows the overall survey response levels;

Table 4.1: Overall survey response level

| Group               | Questionnaire Distributed | Questionnaire Returned | Percentage Returned (%) |
|---------------------|---------------------------|------------------------|-------------------------|
| Client(ERA)         | 12                        | 10                     | 83.33                   |
| Consultants         | 14                        | 10                     | 71.43                   |
| Insurance Companies | 16                        | 13                     | 81.25                   |
| Contractors         | 17                        | 12                     | 70.59                   |
| Total               | 59                        | 45                     | 76.27                   |

### 4.3. Analysis and Discussion of Results

In this section, analysis of respondents understanding and views on construction risks, assessment and management have been considered and discussed. The responses of the various contract groups to the questionnaire (Appendix 5) were analyzed and discussed in subsequent section.

#### 4.3.1. Respondents Position in the Organization

The purpose of section one was to know the capacity in which respondents have undertaken risk management and insurance. The questionnaire was to be completed by respondents who were involved in construction works, contract administration as well as construction insurance.

The survey result shows that 33.3 percent of the respondents were on top management position, 33.3 percent were in the middle management position, and 31.1 percent were in expert position and 2.2 percent were in the other group in their respective organizations.

The percentage distribution of the various professionals indicates that majority of the questionnaires were completed directly by professionals involved in the construction and insurance related works. The survey also shows that it was well represented by all professionals in the construction management and the insurance industry and these groups of respondents are expected to have plenty of experience on the subject matter.

Table 4.2: Position of respondents

| NO | Position of Respondents | CLIENT       |         | CONSULTANTS  |         | INSUR. COMP. |         | CONTRACTORS  |         | Overall % Resp. |
|----|-------------------------|--------------|---------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                         | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | Top Management          | 2            | 20.00   | 3            | 30      | 6            | 46.15   | 4            | 33.33   | 33.33           |
| 2  | Middle Management       | 2            | 20.00   | 4            | 40      | 3            | 23.08   | 6            | 50.00   | 33.33           |
| 3  | Expert                  | 5            | 50.00   | 3            | 30      | 4            | 30.77   | 2            | 16.67   | 31.11           |
| 4  | Other                   | 1            | 10.00   | 0            | 0       | 0            | 0.00    | 0            | 0.00    | 2.22            |
|    | Total                   | 10           | 100     | 10           | 100     | 13           | 100     | 12           | 100     | 100             |

#### 4.3.2. Experience of Respondents

Out of the 45 respondents, the data depicted below shows that 11.1% of the respondents had 5 or less years of working experience, 57.8% had 6 to 10 years of experience and 31.1% had more than 10 years of experience. This implies that the respondents have quite a reasonable working experience in the construction industry, considering 57.8% of respondents with 6 to 10 years working experience and 31.1% having more than 10 years of working experience.

Table 4.3: Respondents' experience in the road construction industry

| NO | Experience of Respondents | CLIENT       |         | CONSULTANTS  |         | INSUR. COMP. |         | CONTRACTORS  |         | Overall % Resp. |
|----|---------------------------|--------------|---------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                           | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | 5 years or less           | 1            | 10      | 0            | 0       | 4            | 30.77   | 0            | 0.00    | 11.11           |
| 2  | From 6 to 10 years        | 7            | 70      | 6            | 60      | 5            | 38.46   | 8            | 66.67   | 57.78           |
| 3  | 10 years and above        | 2            | 20      | 4            | 40      | 4            | 30.77   | 4            | 33.33   | 31.11           |
| 4  | Total                     | 10           | 100     | 10           | 100     | 13           | 100     | 12           | 100     | 100             |

### 4.3.3. Understanding of the Concept of Risk Management

This question was put forward to respondents to identify their level of understanding of the risk management concept. From the analysis of the results shown in Table 4.4, the following picture emerged:

- (i) About 50% of consultants understand risk management through reading and practice; it was 40%, 46.2% and 41.7% in the case of client, insurance companies and contractors respectively;
- (ii) An overall response rate of 17.8% of respondents understands risk management only through practice. This consists of 10% by client, 10% by consultants, 15.4% by insurance companies and 25% by contractors. This shows that a high percentage of contractors understand risk management only through practice;
- (iii) All the respondents have some knowledge of risk management; and
- (iv) Only 37.8% overall percentage of response rate understand risk management only through reading.

Table 4.4: The level of understanding of the concept of risk management

| NO | Understanding of Risk Management               | CLIENT       |         | CONSULTANTS  |         | INSUR. COMP. |         | CONTRACTORS  |         | Overall % Resp. |
|----|------------------------------------------------|--------------|---------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                                                | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | Understand deeply through reading and practice | 4            | 40      | 5            | 50      | 6            | 46.15   | 5            | 41.67   | 44.44           |
| 2  | Only read about it                             | 5            | 50      | 3            | 30      | 5            | 38.46   | 4            | 33.33   | 37.78           |
| 3  | Not read about it but understand from practice | 1            | 10      | 2            | 10      | 2            | 15.38   | 3            | 25.00   | 17.78           |
| 4  | No knowledge about it                          | 0            | 0       | 0            | 0       | 0            | 0       | 0            | 0       | 0               |
|    | Total                                          | 10           | 100     | 10           | 100     | 13           | 100     | 12           | 100     | 100             |

### 4.3.4. Formal Risk Analysis Practice

The respondents were asked on their formal risk analysis practices. The survey result indicates that 75% of the contractors conduct a formal risk analysis that is followed by 70%, 61.5% and 40% of risk analysis practice by the consultants, insurance companies and

the client respectively. Table 4.5 further shows that 62.2% of the overall respondents conduct a formal risk analysis and 37.8% do not exercise a formal risk analysis.

Table 4.5: Formal risk analysis practice of respondents

| NO. | Question                                                                                                                                     | CLIENT       |         | CONSULTANTS  |         | INSUR. COMP. |         | CONTRACTORS  |         | Overall % Resp. |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|     |                                                                                                                                              | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1   | Do you have a formal risk analysis practice in your company before submission of tender and then after during construction (yes respondents) | 4            | 40      | 7            | 70      | 8            | 61.54   | 9            | 75      | 62.22           |
| 2   | Do you have a formal risk analysis practice in your company before submission of tender and then after during construction (No respondents)  | 6            | 60      | 3            | 30      | 5            | 38.46   | 3            | 25      | 37.78           |
|     | Total                                                                                                                                        | 10           | 100     | 10           | 100     | 13           | 100     | 12           | 100     | 100             |

#### 4.3.5. Methods of Risk Identification

Tables 4.6, 4.7, and 4.8 show responses by client, consultants and contractors to the methods of risks identification implemented in the road construction projects. These factors were ranked according to how often they are used.

The survey shows that the client ranking “By the opinion of external consultant” as the number one method of risk identification, the consultant on the other hand ranked it as the number 8 method of risk identification. The Consultants and the Contractors ranked “Visits to site” as the number one method of risk identification. This clearly shows that majority of the contract groups use “Visits to site” as a method of risk identification.

The use of external consultant opinion was ranked no.1 by the client however, the consultants and the contractors were ranked it no.8. By past experience or analysis of prior projects was ranked no.2 by consultants and contractors but the client ranked it no. 4.

Table 4.6 Client's responses to the ranking of the methods of risks identification

| NO | METHODS OF RISK IDENTIFICATION                 | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|----|------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|    |                                                | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1  | Brainstorming amongst a project team           | 6     | 1 | 2 | 0 | 1 | 0.38                      | 7    |
| 2  | By past experience /Analysis of prior projects | 1     | 1 | 3 | 3 | 2 | 0.68                      | 4    |
| 3  | Judgment of the estimator/Quantity surveyor    | 0     | 2 | 1 | 4 | 3 | 0.76                      | 3    |
| 4  | By the risk management department in the firm  | 5     | 3 | 1 | 1 | 0 | 0.36                      | 8    |
| 5  | By the opinion of external consultant          | 0     | 1 | 1 | 4 | 4 | 0.82                      | 1    |
| 6  | Checklists                                     | 4     | 3 | 1 | 2 | 0 | 0.42                      | 6    |
| 7  | Visits to site                                 | 0     | 1 | 3 | 1 | 5 | 0.8                       | 2    |
| 8  | Tender review by management                    | 1     | 3 | 2 | 1 | 2 | 0.54                      | 5    |

Table 4.7: Consultant's responses to the ranking of the methods of risks identification

| NO | METHODS OF RISK IDENTIFICATION                 | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|----|------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|    |                                                | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1  | Brainstorming amongst a project team           | 2     | 3 | 3 | 1 | 1 | 0.52                      | 5    |
| 2  | By past experience /Analysis of prior projects | 0     | 1 | 2 | 4 | 3 | 0.78                      | 2    |
| 3  | Judgment of the estimator/Quantity surveyor    | 1     | 2 | 4 | 2 | 1 | 0.6                       | 3    |
| 4  | By the risk management department in the firm  | 5     | 3 | 2 | 0 | 0 | 0.34                      | 7    |
| 5  | By the opinion of external consultant          | 8     | 1 | 1 | 0 | 0 | 0.26                      | 8    |
| 6  | Checklists                                     | 4     | 3 | 2 | 1 | 0 | 0.4                       | 6    |
| 7  | Visits to site                                 | 0     | 1 | 2 | 3 | 4 | 0.8                       | 1    |
| 8  | Tender review by management                    | 1     | 4 | 3 | 1 | 1 | 0.54                      | 4    |

Table 4.8: Contractor's responses to the ranking of the methods of risks identification

| NO | METHODS OF RISK IDENTIFICATION                 | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|----|------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|    |                                                | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1  | Brainstorming amongst a Project team           | 2     | 1 | 2 | 5 | 2 | 0.67                      | 4    |
| 2  | By past experience /Analysis of prior projects | 1     | 0 | 0 | 6 | 5 | 0.83                      | 2    |
| 3  | Judgment of the estimator/Quantity surveyor    | 1     | 4 | 5 | 1 | 1 | 0.55                      | 6    |
| 4  | By the risk management department in the firm  | 6     | 1 | 2 | 2 | 1 | 0.45                      | 7    |
| 5  | By the opinion of external Consultant          | 9     | 0 | 3 | 0 | 0 | 0.30                      | 8    |
| 6  | Checklists                                     | 1     | 2 | 5 | 3 | 1 | 0.62                      | 5    |
| 7  | Visits to site                                 | 0     | 0 | 1 | 5 | 6 | 0.88                      | 1    |
| 8  | Tender review by management                    | 1     | 0 | 1 | 5 | 5 | 0.82                      | 3    |

#### 4.3.6. Responsible Person for Risk Analysis in the Organization

The respondents were asked to disclose the person responsible for the performance of risk analysis in their respective organizations. The result in table 4.9 shows that the client mainly uses design/supervision consultant, departmental personnel and safety officer(s) within your organization to analysis risks with a percentage of 60%, 30% and 10% respectively.

The consultants on the other hand responded that 40% use departmental personnel to analyze risks followed by 30% and 20% for Safety officer(s) within your organization and Risk manager within your organization respectively.

Contractors mainly use departmental personnel with a response rate of 50% followed by Safety officer(s) within your organization with a response rate of 33.3%.

The overall response rate reflects that 40.6% of the contract group uses departmental personnel to analyze risks and 25% use safety officer(s) within your organization.

Table 4.9: Responsible person for risk analysis in the organization

| NO | Who Performs the Risk Analysis             | CLIENT       |         | CONSULTANTS  |         | CONTRACTORS  |         | Overall % Resp. |
|----|--------------------------------------------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                                            | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | Risk manager within your organization      | 0            | 0       | 2            | 20      | 1            | 8.3     | 9.38            |
| 2  | Design/Supervision Consultant              | 6            | 60      | 0            | 0       | 0            | 0.0     | 6.00            |
| 3  | Safety officer(s) within your organization | 1            | 10      | 3            | 30      | 4            | 33.3    | 25.00           |
| 4  | Independent risk consultant                | 0            | 0       | 0            |         | 0            | 0.0     | 0               |
| 5  | Insurance broker(s)                        | 0            | 0       | 1            | 10      | 1            | 8.3     | 6.25            |
| 6  | Departmental personnel                     | 3            | 30      | 4            | 40      | 6            | 50.0    | 40.62           |
| 7  | Other                                      | 0            | 0       | 0            | 0       | 0            | 0       | 0               |
|    | Total                                      | 10           | 100     | 10           | 100     | 12           | 100     | 100             |

#### 4.3.7. The Time of Risk Analysis in Project Cycle

As indicated in Table 4.10, the client mainly conducts the risk analysis at the end of final design with a response rate of 50% and during construction phase with response rate of 30% followed by 20% at the time of tendering.

The consultants are conducting the risk analysis at different stage of project cycle with response rates of 30%, 20%, 20%, 10%, and 10% during construction phase, at the end of final design, at the end of preliminary Engineering design and at the planning phase respectively.

The Contractors response rate shows that 41. 7% of the respondents conduct the risk analysis at the time of tendering following by 33.3% during construction phase.

The overall response rate shows that 31.3%, 28.1% and 25.0% of the respondents of the contract group conducts the risk analysis during construction phase, at the end of final design and at the time of tendering respectively.

Table 4.10: The time of risk analysis in the stage of project cycle

| NO | At what Stage of Project Cycle the Risk Analysis is Performed | CLIENT       |         | CONSULTANTS  |         | CONTRACTORS  |         | Overall % Resp. |
|----|---------------------------------------------------------------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                                                               | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | At the planning phase                                         | 0            | 0       | 1            | 10      | 1            | 8.33    | 6.25            |
| 2  | At the end of conceptual design                               | 0            | 0       | 2            | 20      | 0            | 0.00    | 6.25            |
| 3  | At the end of preliminary Engineering design                  | 0            | 0       | 1            | 10      | 0            | 0.00    | 3.13            |
| 4  | At the end of final design                                    | 5            | 50      | 2            | 20      | 2            | 16.67   | 28.13           |
| 5  | At the time of tendering                                      | 2            | 20      | 1            | 10      | 5            | 41.67   | 25.00           |
| 6  | During construction phase                                     | 3            | 30      | 3            | 30      | 4            | 33.33   | 31.25           |
| 7  | After completion of the construction                          | 0            | 0       | 0            | 0       | 0            | 0.00    | 0.00            |
|    | Total                                                         | 10           | 100     | 10           | 100     | 12           | 100     | 100             |

#### 4.3.8. The Process of Risk Analysis

As shown in the table below, 40% of the respondents of the client just add a percentage to budget/cost to cope with uncertainties and 30% responded the use of various mathematical tools: such as sensitivity analysis, net present value etc.

On the other hand, 40% of the consultants' respondents identify risk factors and quantify their impact using probability of occurrence, range of risk costs and simulation and 30% of the respondents' use various mathematical tools: such as sensitivity analysis, net present value etc.

50% of the response rate of the contractors' shows that just adding a percentage to budget/cost to cope with uncertainties that is followed by 25% of respondents identify major risk factors and quantify their impact subjectively. 16. 7% of the respondents use various mathematical tools: such as sensitivity analysis, net present value etc. and only 8.33% identify risk factors and quantify their impact using probability of occurrence, range of risk costs and simulation.

The overall response rate shows that 34.4% of the contract groups just add a percentage to budget/cost to cope with uncertainties that is followed by 25.5% use of various mathematical tools: such as sensitivity analysis, net present value etc.

Table 4.11: The process of risk analysis consists of

| NO | What Does the Risk Analysis Consists of                                                                             | CLIENT       |         | CONSULTANTS  |         | CONTRACTORS  |         | Overall % Resp. |
|----|---------------------------------------------------------------------------------------------------------------------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                                                                                                                     | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | Just adding a percentage to budget/cost to cope with uncertainties                                                  | 4            | 40      | 1            | 10      | 6            | 50.00   | 34.38           |
| 2  | Identify major risk factors and quantify their impact subjectively                                                  | 1            | 10      | 2            | 20      | 3            | 25.00   | 18.75           |
| 3  | Use of various mathematical tools: such as sensitivity analysis, net present value etc.                             | 3            | 30      | 3            | 30      | 2            | 16.67   | 25.00           |
| 4  | Identify risk factors and quantify their impact using probability of occurrence, range of risk costs and simulation | 1            | 10      | 4            | 40      | 1            | 8.33    | 18.75           |
| 5  | Other                                                                                                               | 0            | 0       | 0            | 0       | 0            | 0       | 0               |
|    | Total                                                                                                               | 10           | 100     | 10           | 100     | 12           | 100     | 100             |

#### 4.3.8. Risk Allocation Principles Adherence

The contract parties were asked to compare the prevailing risk allocation in the road construction projects with the general principle of risk allocation. The overall response rate indicates that 53.1% of the respondents agree that the principles are followed against 18.8% response rate which responded disagrees. 25.0% of the response rate shows neutral as shown in Table 4.12.

Table 4.12: Risk allocation principles adherence

| NO | Risk Allocation Principles Adherence | CLIENT       |         | CONSULTANTS  |         | CONTRACTORS  |         | Overall % Resp. |
|----|--------------------------------------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                                      | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | Strongly Agree                       | 1            | 10      | 0            | 0       | 1            | 8.33    | 6.25            |
| 2  | Agree                                | 6            | 60      | 6            | 60      | 5            | 41.67   | 53.13           |
| 3  | Neutral                              | 2            | 20      | 2            | 20      | 4            | 33.33   | 25.00           |
| 4  | Disagree                             | 1            | 1       | 2            | 20      | 2            | 16.67   | 18.75           |
| 5  | Strongly Disagree                    | 0            | 0       | 0            | 0       | 0            | 0.00    | 0.00            |
|    | Total                                | 10           | 100     | 10           | 100     | 12           | 100     | 100             |

### 4.3.9. Insurance Provision Practices

As indicated in Table 4.13, the survey revealed that 70% of the response rate of the client considers insurance provision in the selection of contractors and consultants, 40% of consultants and 66.7% of contractors consider insurance provision in the selection of sub-contractors and consultants. On the other hand, 53.1% of the respondents show no response for the purchase of insurance as part of a risk management tool but only 46.9% of the overall respondents purchase insurance as part of their construction risks management.

The contracting parties were asked on their interaction with insurance companies on risk identification, allocation and insurance policies before signing contract. The survey revealed that 75% of the response rate shows that there is no interaction with insurance companies.

Table 4.13 shows the various contract groups responses to the following questions.

Table 4.13: Interaction in risk identification, allocation and insurance provision

| No | Question                                                                                                                                                      | CLIENT       |         | CONSULTANTS  |         | CONTRACTORS  |         | Overall % Resp. |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                                                                                                                                                               | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | Do you consider construction insurance provisions in your contract conditions in the selection of Contractors/Subcontractors or Consultants (yes respondents) | 7            | 70      | 4            | 40      | 8            | 66.67   | 59.38           |
| 2  | Do you consider construction insurance provisions in your contract conditions in the selection of Contractors/Subcontractors or Consultants (No respondents)  | 3            | 30      | 6            | 60      | 4            | 33.33   | 40.63           |
| 3  | Do you purchase insurance policies as part of your construction risks management in your road projects (yes respondents)                                      | 6            | 60      | 2            | 20      | 7            | 58.33   | 46.88           |
| 4  | Do you purchase insurance policies as part of your construction risks management in your road projects (No respondents)                                       | 4            | 40      | 8            | 80      | 5            | 41.67   | 53.13           |
| 5  | Do you normally interact with insurance companies in risk identification, allocation and insurance policies before signing contract (yes respondents)         | 1            | 10      | 3            | 30      | 4            | 33.33   | 25.00           |
| 6  | Do you normally interact with insurance companies in risk identification, allocation and insurance policies before signing contract (No respondents)          | 9            | 90      | 7            | 70      | 8            | 66.67   | 75.00           |
|    | Total                                                                                                                                                         | 10           | 100     | 10           | 100     | 12           | 100     | 100             |

#### 4.3.10. Factors in Determining whether a Risk is Insurable or Not

As depicted in Tables 4.14, 4.15, 4.16 and 4.17 above, the responses by the contract groups in determining whether a risk is insurable or not varies accordingly. The survey shows that the client, the consultants, insurer and the contractors ranking “Past history of the risk” as the number one factor in determining the insurability of a risk. This clearly shows that majority of the various contract groups use past history of the risk as a factor in determining whether a risk is insurable or not.

On the other hand, the contractor and the insurance companies ranked as number 2 “Easy to determine the Cause of damage”. The client and the consultants ranked number 2 “Easy to determine the extent of damage”.

“Difficulty in assessing the risk premium” was ranked number 8 by insurance companies. The client and the consultants ranked it as no.7. The results clearly show that difficulty in assessing the risk premium is one of the list factors in determining whether a risk is insurable or not. Tables 4.14, 4.15, 4.16 and 4.17 show responses of client, consultants, insurance companies and contractors on whether a risk is insurable or not.

Table 4.14: Client's responses to the ranking of factors in determining whether a risk is insurable or not

| No. | FACTORS                                 | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|-----|-----------------------------------------|-------|---|---|---|---|---------------------------|------|
|     |                                         | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1   | Past history of the risk                | 0     | 1 | 2 | 4 | 3 | 0.78                      | 1    |
| 2   | Easy to assess the extent of damage     | 1     | 2 | 3 | 2 | 2 | 0.64                      | 2    |
| 3   | Easy to determine the cause of damage   | 2     | 3 | 4 | 1 | 0 | 0.48                      | 5    |
| 4   | Risks with high premiums                | 3     | 3 | 2 | 2 | 0 | 0.46                      | 6    |
| 5   | Difficult in assessing the risk premium | 4     | 3 | 2 | 1 | 0 | 0.4                       | 7    |
| 6   | Unquantifiable risks                    | 2     | 2 | 3 | 2 | 1 | 0.56                      | 4    |
| 7   | Foreseeable risks                       | 2     | 2 | 3 | 1 | 2 | 0.58                      | 3    |
| 8   | Unforeseeable risks                     | 4     | 3 | 1 | 1 | 1 | 0.34                      | 8    |

Table 4.15: Consultant's responses to the ranking of factors in determining whether a risk is insurable or not

| No. | FACTORS                               | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|-----|---------------------------------------|-------|---|---|---|---|---------------------------|------|
|     |                                       | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1   | Past history of the risk              | 0     | 1 | 1 | 4 | 4 | 0.82                      | 1    |
| 2   | Easy to assess the extent of damage   | 1     | 3 | 3 | 2 | 2 | 0.68                      | 2    |
| 3   | Easy to determine the cause of damage | 1     | 3 | 4 | 2 | 0 | 0.54                      | 6    |
| 4   | Risks with high premiums              | 2     | 2 | 1 | 3 | 2 | 0.62                      | 4    |

|   |                                         |   |   |   |   |   |      |   |
|---|-----------------------------------------|---|---|---|---|---|------|---|
| 5 | Difficult in assessing the risk premium | 2 | 4 | 2 | 2 | 0 | 0.48 | 7 |
| 6 | Unquantifiable risks                    | 1 | 3 | 3 | 2 | 1 | 0.58 | 5 |
| 7 | Foreseeable risks                       | 1 | 2 | 2 | 3 | 2 | 0.66 | 3 |
| 8 | Unforeseeable risks                     | 4 | 2 | 3 | 1 | 0 | 0.42 | 8 |

Table 4.16: Insurance Companies' responses to the ranking of factors in determining whether a risk is insurable or not

| No. | FACTORS                                 | SCORE |   |   |   |    | RELATIVE IMPORTANCE INDEX | RANK |
|-----|-----------------------------------------|-------|---|---|---|----|---------------------------|------|
|     |                                         | 1     | 2 | 3 | 4 | 5  |                           |      |
| 1   | Past history of the risk                | 1     | 0 | 1 | 1 | 10 | 0.89                      | 1    |
| 2   | Easy to assess the extent of damage     | 1     | 2 | 1 | 5 | 4  | 0.74                      | 3    |
| 3   | Easy to determine the cause of damage   | 1     | 1 | 1 | 7 | 3  | 0.75                      | 2    |
| 4   | Risks with high premiums                | 1     | 2 | 4 | 5 | 1  | 0.65                      | 4    |
| 5   | Difficult in assessing the risk premium | 2     | 5 | 4 | 2 | 0  | 0.49                      | 8    |
| 6   | Unquantifiable risks                    | 2     | 3 | 5 | 1 | 2  | 0.57                      | 7    |
| 7   | Foreseeable risks                       | 4     | 2 | 2 | 1 | 4  | 0.58                      | 6    |
| 8   | Unforeseeable risks                     | 1     | 4 | 3 | 2 | 3  | 0.63                      | 5    |

Table 4.17: Contractor's responses to the ranking of factors in determining whether a risk is insurable or not

| No. | FACTORS                                 | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|-----|-----------------------------------------|-------|---|---|---|---|---------------------------|------|
|     |                                         | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1   | Past history of the risk                | 0     | 0 | 2 | 3 | 7 | 0.88                      | 1    |
| 2   | Easy to assess the extent of damage     | 1     | 2 | 3 | 4 | 2 | 0.67                      | 4    |
| 3   | Easy to determine the cause of damage   | 0     | 2 | 3 | 4 | 3 | 0.73                      | 2    |
| 4   | Risks with high premiums                | 0     | 5 | 1 | 6 | 0 | 0.62                      | 5    |
| 5   | Difficult in assessing the risk premium | 0     | 4 | 5 | 2 | 1 | 0.60                      | 6    |
| 6   | Unquantifiable risks                    | 0     | 2 | 4 | 5 | 1 | 0.68                      | 3    |
| 7   | Foreseeable risks                       | 3     | 5 | 3 | 1 | 0 | 0.43                      | 8    |
| 8   | Unforeseeable risks                     | 1     | 6 | 3 | 2 | 0 | 0.50                      | 7    |

#### 4.3.11. Provision of Insurance Cover/Policy

The survey from Table 4.18 below shows the following results;

(1) 20% of the client response rate sought for insurance cover with the aim of meeting the demand of the client. This was 60% in the case of consultants, and 33.3% of contractors. On the average about 37.5% of all respondents sought insurance cover to meet the demand of the

client for the provision of insurance policy. This is the largest among the factors stated.

(2) 40% of the client, 30% of consultants and 16.7% of contractors considered "to reduce the impact of any disaster during construction" as a reason for the provision of insurance policy. This has an overall response rate of 28.1%.

(3) "To meet tender and contract requirement" attracted an overall response rate of 25%. This reason was cited by 30% of client, 10% of consultants and 33.3% of contractors. This factor attracted a comparatively high response rate from contractors; and

(4) Recommendation of insurance adviser resulted in 10% response rate from client, 0% from consultants and 0% from contractors. The overall response rate is 3.1%. This factor received the least overall response rate from the various contract groups.

The above results also show that the highest percentage response rate of contractors on the essence of provision of insurance policies is 33.3% that is to meet the demand of the client and tender and contract requirements equally. This clearly shows that contractors' understanding of the essence of provision of insurance policies in the construction industry by their own initiation to transfer risk is low.

The overall response by the contract groups in order of high response rate shows the following; (1) To meet the demand of the client, (2) to reduce the impact of any disaster during or after construction, (3) to meet tender and contract requirement and meeting the demand of clients as reason for the provision of insurance cover.

Table 4.18: Response to the essence of providing insurance policies

| N<br>O | Why the provision of insurance cover                     | CLIENT          |            | CONSULTANTS     |            | CONTRACTORS     |            | Overall %<br>Resp. |
|--------|----------------------------------------------------------|-----------------|------------|-----------------|------------|-----------------|------------|--------------------|
|        |                                                          | No. of<br>Resp. | %<br>Resp. | No. of<br>Resp. | %<br>Resp. | No. of<br>Resp. | %<br>Resp. |                    |
| 1      | To meet the demand of the client                         | 2               | 20         | 6               | 60         | 4               | 33.33      | 37.50              |
| 2      | To reduce the impact of any disaster during construction | 4               | 40         | 3               | 30         | 2               | 16.67      | 28.13              |
| 3      | To meet tender and contract requirement                  | 3               | 30         | 1               | 10         | 4               | 33.33      | 25.00              |
| 4      | Recommendation of Insurance Adviser                      | 1               | 10         | 0               | 0          | 0               | 0.00       | 3.13               |
|        | Total                                                    | 10              | 100        | 10              | 100        | 12              | 100        | 100                |

#### 4.3.12. Problems/Concerns with the Provision of Insurance

The respondents were asked to point out the current problems of insurance provision in the road construction industry. The survey from table 4.19 below shows the following results;

The overall response by the contract groups shows that lack of knowledge in insurance accounts 33.3% and complex policy language is 28.9%. Rising cost of premiums is 13.3% which is followed by 8.9% for impact of reinsurer cost on the premium and lack of proper coverage or exclusion equally for the provision of insurance cover.

This clearly shows that the main problems/concerns with the provision of insurance in the road construction sector are mainly lack of knowledge in insurance and complex policy language in the road construction industry in addition to the other factors.

Table 4.19: Problems with the provision of insurance

| NO | Problems with the provision of insurance       | CLIENT       |         | CONSULTANTS  |         | INSUR. COMP. |         | CONTRACTORS  |         | Overall % Resp. |
|----|------------------------------------------------|--------------|---------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|    |                                                | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1  | Rising cost of premiums                        | 2            | 20      | 1            | 10      | 2            | 15.38   | 1            | 8.33    | 13.33           |
| 2  | Fewer companies willing to insure              | 1            | 10      | 0            | 0       | 0            | 0.00    | 0            | 0.00    | 2.22            |
| 3  | Complex policy language                        | 3            | 30      | 3            | 30      | 3            | 23.08   | 4            | 33.33   | 28.89           |
| 4  | Lack of proper coverage or exclusion           | 0            | 0       | 2            | 20      | 1            | 7.69    | 1            | 8.33    | 8.89            |
| 5  | High collateral demands by insurance companies | 0            | 0       | 1            | 10      | 1            | 7.69    | 0            | 0.00    | 4.44            |
| 6  | Lack of knowledge in insurance                 | 3            | 30      | 3            | 30      | 4            | 30.77   | 5            | 41.67   | 33.33           |
| 7  | Impact of reinsurer cost on the premium        | 1            | 10      | 0            | 0       | 2            | 15.38   | 1            | 8.33    | 8.89            |
|    | Total                                          | 10           | 100     | 10           | 100     | 13           | 100     | 12           | 100     | 100             |

#### 4.3.13. Visit to Site Before/During Construction

From Table 4.20 below it can be learnt that, the overall survey result revealed that 84.4% of contract group confirmed that the insurance companies do not visit the project site before and during the construction of road projects. In addition, 76.9% of insurance companies admitted that they do not visit the project site before or after the issuance of insurance policies.

From the above analysis, one can conclude that presently, insurance companies only provide insurance covers but do not visit the project sites. This shows that no proper measures and controls are put in place by insurers to prevent or minimize the occurrence of risk.

Table 4.20: Response of various contract groups

| NO. | Question                                                                                                                                           | CLIENT       |         | CONSULTANTS  |         | INSUR. COMP. |         | CONTRACTORS  |         | Overall % Resp. |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|     |                                                                                                                                                    | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1   | Do the insurance companies visit the project site before issuing the insurance cover and during construction (yes respondents)                     | 2            | 20      | 1            | 10      | 3            | 23.07   | 1            | 8.33    | 15.56           |
| 2   | Do the insurance Companies visit the project site before issuing the insurance cover and during construction (yes respondents)<br>(No respondents) | 8            | 80      | 9            | 90      | 10           | 76.92   | 11           | 91.67   | 84.44           |
|     | Total                                                                                                                                              | 10           | 100     | 10           | 100     | 13           | 100     | 12           | 100.00  | 100             |

#### 4.3.14. Professional Indemnity Insurance Provision

Consultants were asked whether they provide or not professional indemnity insurance for the service they deliver. As indicated in the table above, 80% of the respondents do not have professional indemnity insurance for the service they offer. Only 20% of the respondents confirmed that they have the professional indemnity insurance.

The result of the survey in Table 4.21 clearly shows that most of the consultants are delivering the design and construction supervision service without the professional indemnity insurance cover.

Table 4.21: Response of consultants

| NO. | Question                                                                                       | CONSULTANTS  |         |
|-----|------------------------------------------------------------------------------------------------|--------------|---------|
|     |                                                                                                | No. of Resp. | % Resp. |
| 1   | Do you have a professional indemnity insurance for the service you deliver (yes respondents)   | 2            | 20      |
| 2   | Do you have a professional indemnity insurance for the service you deliver<br>(No respondents) | 8            | 80      |
|     | Total                                                                                          | 10           | 100     |

#### 4.3.15. Occurrence of Accident on Projects

From the analysis of Table 4.22 below, it can be seen that 65.6% of respondents have encountered construction accident in the construction sites and 56.3% confirmed that compensated/or denied by insurance coverage. This indicates that road construction projects are subject to risks.

Table 4.22: Response of various contract groups

| NO. | Question                                                                                                                      | CLIENT       |         | CONSULTANTS  |         | CONTRACTORS  |         | Overall % Resp. |
|-----|-------------------------------------------------------------------------------------------------------------------------------|--------------|---------|--------------|---------|--------------|---------|-----------------|
|     |                                                                                                                               | No. of Resp. | % Resp. | No. of Resp. | % Resp. | No. of Resp. | % Resp. |                 |
| 1   | Have you ever encountered any severe accident/damage during construction of road projects you were involved (yes respondents) | 7            | 70      | 6            | 60      | 8            | 66.67   | 65.62           |
| 2   | Have you ever encountered any severe accident/damage during construction of road projects you were involved (No respondents)  | 3            | 30      | 4            | 40      | 4            | 33.33   | 34.37           |
| 3   | Do you have any damage occurred in your road projects and compensated/denied by insurance claims (yes respondents)            | 5            | 50      | 6            | 60      | 7            | 58.33   | 56.25           |
| 4   | Do you have any damage occurred in your road projects and compensated/denied by insurance claims (No respondents)             | 5            | 50      | 4            | 40      | 5            | 41.67   | 43.75           |
|     | Total                                                                                                                         | 10           | 100     | 10           | 100     | 12           | 100     | 100             |

#### 4.3.16. How a Typical Insurance Premium is fixed

The insurance companies were asked on how they fix a typical insurance policy premium. As shown in Table 4.23, 46.2% of respondents fix the insurance premium based on the location of the project while 38.5% of the respondents base contract amount of the project to fix the premium. While 30.8% of respondents use previous experience in fixing the premium only 23.1% use detail study of the project followed by 15.4% use expert estimate.

From the survey result depicted in Table 4.23 below, it can be concluded that there is no uniform method of fixing the premium among the insurance companies.

Table 4.23: Response of insurance companies

| NO | How Insurance Premium is fixed | Insurance Companies |         |
|----|--------------------------------|---------------------|---------|
|    |                                | No. of Resp.        | % Resp. |
| 1  | Detail Study of the Project    | 3                   | 23.1    |
| 2  | Previous experience            | 4                   | 30.8    |
| 3  | Expert estimate                | 2                   | 15.4    |
| 4  | Contract amount                | 5                   | 38.5    |
| 5  | Location of the project        | 6                   | 46.2    |
| 7  | Other                          | 0                   | 0.0     |

#### 4.4. Ranking of Risk Factors in the Road Construction Industry

Appendices 1-4 show the relative importance indices and the relative ranking of the 50 list of factors that are considered to be risk factors in the construction industry for the purpose of this study. The rankings were assigned based on the factor relative importance index.

The formula for relative importance index is:

$$\frac{\sum W}{S \times N} \quad 0 \leq \text{INDEX} \leq 1 \quad [\text{Eq. 4.1}]$$

Where;  $\sum W$  = The summation of the weighting given to each factor

$S$  = Maximum score = 5

$N$  = Total number of firms that responded in the sample

For each factor the weighted average was achieved by adding the products as shown in the formula below:

(a) The RII of each group and

(b) The proportion of the total respondents

$$\text{Weighted Average} = \frac{n_1 \text{RII} (1)}{N} + \frac{n_2 \text{RII} (2)}{N} + \frac{n_3 \text{RII} (3)}{N} + \frac{n_4 \text{RII} (4)}{N} \quad [\text{Eq. 4.2}]$$

Where;

- $n_1$  = No of respondents for client
- $n_2$  = No of respondents for consultants
- $n_3$  = No of respondents for insurance companies
- $n_4$  = No of respondents for contractors
- RII = Relative importance index for client
- RII = Relative importance index for consultants
- RII = Relative importance index for insurance companies
- RII = Relative importance index for contractors
- $N$  = The number of respondents groups

Based on the analysis of the results shown in the tables of appendix 1-4, the following were deduced:

##### 4.4.1. Client

With reference to appendix 1, 2 and 3 which respectively show the rankings for risk factors, most used insurance policies and insurable risks in construction, it was observed that the client ranked the following as the ten most risk factors, insurable risks and insurance policies in the Ethiopian road construction industry:

Table 4.24: Ten most important risk factors, insurable risks and most used insurance policies by the client

| NO | Ten most important risk Factors            | Ten most important Insurable risks        | Ten most used insurance policies               |
|----|--------------------------------------------|-------------------------------------------|------------------------------------------------|
| 1  | Payment to contractors for Work done,      | Strikes and labor disputes                | Contractor's all risk Insurance                |
| 2  | Shortage of materials in the market        | Injury to property                        | Bid bond                                       |
| 3  | Poor site management and supervision       | Materials damage during transportation    | Performance bonds and Guarantees               |
| 4  | Inadequate managerial skills               | Fire                                      | Plant and Equipment Insurance                  |
| 5  | Inadequate contractor experience           | Injury to persons                         | Comprehensive Commercial vehicles insurance    |
| 6  | Shortage of liquidity                      | Weather                                   | Third party insurance                          |
| 7  | Change orders/Variations                   | Theft                                     | Workers compensation                           |
| 8  | Fluctuations (changes in cost)             | Extra ordinary wind                       | Fire perils insurance on premises and contents |
| 9  | Damages and delays during construction     | Contractor failure to enter into contract | Goods in transit/Transport floater             |
| 10 | Long waiting time for approval of drawings | Earth quake                               | Public liability Insurance                     |

#### 4.4.2. Consultants

In a similar manner, Table 4.25 shows the ranking by consultants the ten most important risk factors, the ten most insurable risks as well as the ten most used insurance policies:

Table 4.25: Ten most important risk factors, insurable risks and most used insurance policies by consultants

| NO | Ten most important risk Factors              | Ten most important insurable risks     | Ten most used insurance policies               |
|----|----------------------------------------------|----------------------------------------|------------------------------------------------|
| 1  | Delay in Payment to contractor for work done | Injury to property                     | Bid bond                                       |
| 2  | Shortage of materials in market              | Injury to person                       | Performance bonds and Guarantees               |
| 3  | Poor site management and Supervision         | Damages and delay during construction  | Contractor's all risk Insurance                |
| 4  | Shortage of liquidity                        | Fire                                   | Plant and Equipment Insurance                  |
| 5  | Inadequate contractor experience             | Weather                                | Fire perils insurance on premises and contents |
| 6  | Inadequate managerial skills                 | Extra ordinary wind                    | Comprehensive Commercial vehicles insurance    |
| 7  | Fluctuations (changes in cost)               | Heavy rain                             | Goods in transit/Transport floater             |
| 8  | Delays in subcontractors work                | Theft                                  | Professional Indemnity Insurance               |
| 9  | Unforeseen ground conditions                 | Materials damage during transportation | Workers compensation Insurance                 |
| 10 | Long waiting time for approval of drawings   | Strikes and labour disputes            | Public liability Insurance                     |

#### 4.4.3. Insurance Companies

Table 4.26 shows the ten most important risk factors, the ten most insurable risks and ten most used insurance policies ranked by Insurance Companies in construction.

Table 4.26: Ten most important risk factors, insurable risks and most used insurance policies by insurance companies

| NO | Ten most important risk factors      | Ten most important insurable risks     | Ten most used insurance policies            |
|----|--------------------------------------|----------------------------------------|---------------------------------------------|
| 1  | Payment to contractors for Work done | Injury to person                       | Comprehensive Commercial vehicles insurance |
| 2  | Shortage of materials in market      | Injury to property                     | Bid bond                                    |
| 3  | Poor site management and Supervision | Heavy rain                             | Plant and Equipment Insurance               |
| 4  | Inappropriate type of foundation     | Materials damage during transportation | Performance bonds and Guarantees            |
| 5  | Shortage of liquidity                | Heavy rain                             | Contractors all risk Insurance              |
| 6  | Inadequate managerial skills         | Weather                                | Goods in transit/Transport floater          |
| 7  | Change orders/Variations             | Damages and delays during construction | Workers compensation Insurance              |

|    |                                |                    |                                |
|----|--------------------------------|--------------------|--------------------------------|
| 8  | Strikes and labor disputes     | Theft              | Third party insurance          |
| 9  | Fluctuations (changes in cost) | Earth quake        | Major Medical Insurance        |
| 10 | Unforeseen ground conditions   | Extraordinary wind | Employers' liability Insurance |

#### 4.4.4. Contractors

Table 4.27 shows the ten most important risk factors, the ten most insurable risks and the ten most used insurance policies in the Ethiopian road construction industry ranked by contractors. Details of these are shown in appendix 1, 2 and 3 respectively.

Table 4.27: The ten most important risk factors, insurable risks and most used insurance policies by contractors

| NO | Ten most important risk Factors              | Ten most important Insurable risks        | Ten most used insurance policies               |
|----|----------------------------------------------|-------------------------------------------|------------------------------------------------|
| 1  | Shortage of liquidity                        | Fire                                      | Bid bond                                       |
| 2  | Delay in Payment to contractor for work done | Injury to person                          | Performance bonds and Guarantees               |
| 3  | Delays in subcontractors work                | Materials damage during transportation    | Contractor's all risks Insurance               |
| 4  | Low productivity                             | Strikes and labour disputes               | Plant and Equipment Insurance                  |
| 5  | Labor shortage                               | Injury to property                        | Comprehensive Commercial vehicles insurance    |
| 6  | Unforeseen ground conditions                 | Weather                                   | Goods in transit/Transport floater             |
| 7  | Inadequate design team experience            | Damages and delay during construction     | Third party insurance                          |
| 8  | Errors in drawings                           | Contractor failure to enter into contract | Workers compensation Insurance                 |
| 9  | Strikes and labour disputes                  | Materials damage during transportation    | Fire perils insurance on premises and contents |
| 10 | Inadequate contractor experience             | Earth quake                               | Major Medical Insurance                        |

#### 4.5. Agreement Analysis (Concordance Test)

Kendall (1955) presented a Coefficient of Concordance,  $W$ , to evaluate the extent of agreement among a set of judges each of who ranks in entirety a set of objects. Kendall test for concordance is used to measure the degree of agreement of the rank correlation between the respondents.

The Kendall test for concordance,  $W$ , between the client, consultants, insurance companies and contractors was measured using the formula:

$$W = 12S/m(m^2 - 1), \quad 0 \leq W \leq 1.0 \quad [\text{Eq. 4.3}]$$

Where,

$$S = \sum_{i=1}^n (R_i - R)^2 \quad [\text{Eq. 4.4}]$$

$m$  = the number of risk factors

$R$  = average of the ranks assigned to the  $n^{\text{th}}$  factor being ranked

$R_i$  = the assigned rank by an individual judge to one factor

$n$  = Number of Judges

Hence,  $m=50$ ;  $n=4$ ;  $R=25.48$

$$\begin{aligned} S &= 12 \times \sum_{i=1}^n (R_i - R)^2 \\ &= 105,048.00 \\ &\quad m(m^2 - 1) \\ &= 50 \times (50^2 - 1) \\ &= 124,950.00 \end{aligned}$$

Therefore;  $W = 105,048.00 / 124,950.00$

$$W = 0.84$$

A coefficient of  $W=1$  indicates a perfect agreement and zero indicates no agreement. Therefore, the value of the coefficient of concordance,  $W=0.84$  from the above analysis indicates a high degree of agreement amongst the four group of respondents and the calculation is depicted in appendix 4.

#### 4.6. Major Risk Factors Identified

The best estimate for the true ranking of  $n$  variables according to Kendall is provided where  $W$  is significant by the order of various sums of ranks. That is evidenced by the magnitude and significance of  $W$ , therefore the best true ranking is provided by the mean of the ranks. This implies that the most important factor is the highest overall ranking one.

From the analysis in the Tables of appendix 1, 2, 3 and 4, the ten most important risk factors, ten most important insurable risk and ten most used insurance policies from all the groups are shown in Table 4.28 below.

Table 4.28: Major risk factors, insurable risks and most used insurance policies (Using the Kendall concordance test).

| NO | Ten most important risk Factors              | Ten most important Insurable risks     | Ten most used insurance policies               |
|----|----------------------------------------------|----------------------------------------|------------------------------------------------|
| 1  | Delay in Payment to contractor for work done | Injury to property                     | Bid bond                                       |
| 2  | Shortage of materials in the market          | Theft                                  | Performance bonds and guarantee                |
| 3  | Shortage of liquidity                        | Strikes and labour disputes            | Contractor's all risk                          |
| 4  | Poor site management and supervision         | Materials damage during transportation | Plant and Equipment Insurance                  |
| 5  | Inadequate contractor experience             | Injury to person                       | Motor insurance to cover vehicles              |
| 6  | Delays in subcontractors work                | Heavy rain                             | Goods in transit/Transport floater             |
| 7  | Inadequate managerial skills                 | War                                    | Third party insurance                          |
| 8  | Unforeseen ground conditions                 | Fire                                   | Fire perils insurance on premises and contents |
| 9  | Fluctuations (changes in cost)               | Weather                                | Workers compensation insurance                 |
| 10 | Long waiting time for approval of drawings   | Earth quake                            | Employers' liability insurance                 |

Studying the relative importance indices and the ranks of the various factors across the groups, reveals that all the groups rank the various factors differently; with some level of agreement among the various groups. For example, majority of the groups ranked delay in payment for work done by contractors first. There were also a lot of similarities in the ranking of insurable risks as well as insurance policies as shown in the above table.

#### 4.7. Summary

The survey achieved an overall response rate of 76.27%. The analyses of the survey revealed the following key observations:

1. Majority of respondents (consultants and contractors) in the road construction industry uses “site visit” in the identification of risk factors in the construction industry; however, the survey confirmed that insurance companies do not visit the project site before and during the construction of road projects.

2. It was also shown that “past history of the risk” is mostly used in determining whether a risk is insurable or not.
3. It is noted that client, insurance companies, consultants and contractors have their individual preferences on the ranking of risk factors in the road construction industry.
4. It was also clear in the survey that insurance companies only provide insurance covers but do not visit project site or educate other participants especially contractors how to control or minimize the occurrence of construction risks.
5. Most of the respondents confirmed that insurance is provided to meet the demand of the client. On the other hand, majority of respondents from the consultants’ side affirmed that they do not have professional indemnity insurance cover for the service they deliver. The survey further revealed that the current problems and concerns with insurance provision in the construction industry are mainly lack of knowledge in insurance and complex policy language of insurance policies.
6. The analysis of the study has revealed the ten major risk factors in the construction industry according to the four main parties concerned as shown in the table below. Accordingly, delay in payment to contractors for work done is ranked first risk factor by client, insurance companies and consultants. But contractors ranked first shortage of liquidity as a first risk factor and delay in payment to contractor for work done is ranked second risk factor by contractors.

Table 4.29: The ten major risk factors in the road construction industry

| NO. | CLIENT                                        | INSURANCE COMPANIES                           | CONSULTANTS                                  | CONTRACTORS                                  |
|-----|-----------------------------------------------|-----------------------------------------------|----------------------------------------------|----------------------------------------------|
| 1   | Delay in payment to contractors for Work done | Delay in Payment to contractors for Work done | Delay in Payment to contractor for work done | Shortage of liquidity                        |
| 2   | Shortage of materials in the market           | Shortage of materials in market               | Shortage of materials in market              | Delay in Payment to contractor for work done |
| 3   | Poor site management and supervision          | Poor site management and supervision          | Poor site management and supervision         | Delays in subcontractors work                |
| 4   | Inadequate managerial skills                  | Inappropriate type of foundation              | Shortage of liquidity                        | Low productivity                             |
| 5   | Inadequate contractor experience              | Shortage of liquidity                         | Inadequate contractor experience             | Labor shortage                               |
| 6   | Shortage of liquidity                         | Inadequate managerial skills                  | Inadequate managerial skills                 | Unforeseen ground conditions                 |

|    |                                            |                                |                                            |                                   |
|----|--------------------------------------------|--------------------------------|--------------------------------------------|-----------------------------------|
| 7  | Change orders/Variations                   | Change orders/Variations       | Fluctuations (changes in cost)             | Inadequate design team experience |
| 8  | Fluctuations (changes in cost)             | Strikes and labor disputes     | Delays in subcontractors work              | Errors in drawings                |
| 9  | Damages and delays during construction     | Fluctuations (changes in cost) | Unforeseen ground conditions               | Strikes and labour disputes       |
| 10 | Long waiting time for approval of drawings | Unforeseen ground conditions   | Long waiting time for approval of drawings | Inadequate contractor experience  |

7. The analysis of the study has shown the ten most insurable risks in the Ethiopian road construction industry according to the four main parties as shown in the table below. Hence, the client ranked first strikes and labor disputes as the most insurable risks; insurance companies and consultants ranked first injury to person as the most insurable risks and contractors ranked first fire as the most insurable risks.

Table 4.30: Ten most insurable risks in the road construction industry

| NO. | CLIENT                                    | INSURANCE COMPANIES                    | CONSULTANTS                            | CONTRACTORS                               |
|-----|-------------------------------------------|----------------------------------------|----------------------------------------|-------------------------------------------|
| 1   | Strikes and labor disputes                | Injury to person                       | Injury to property                     | Fire                                      |
| 2   | Injury to property                        | Injury to property                     | Injury to person                       | Injury to person                          |
| 3   | Materials damage during transportation    | Heavy rain                             | Damages and delay during construction  | Materials damage during transportation    |
| 4   | Fire                                      | Materials damage during transportation | Fire                                   | Strikes and labour disputes               |
| 5   | Injury to persons                         | Heavy rain                             | Weather                                | Injury to property                        |
| 6   | Weather                                   | Weather                                | Extra ordinary wind                    | Weather                                   |
| 7   | Theft                                     | Damages and delays during construction | Heavy rain                             | Damages and delay during construction     |
| 8   | Extra ordinary wind                       | Theft                                  | Theft                                  | Contractor failure to enter into contract |
| 9   | Contractor failure to enter into contract | Earth quake                            | Materials damage during transportation | Materials damage during transportation    |
| 10  | Earth quake                               | Extraordinary wind                     | Strikes and labour disputes            | Earth quake                               |

8. The research has indicated the ten most used insurance policies in the construction industry according to the four main parties as shown in the table 4.31. According to their ranking, the client ranked first the contractor's all risk insurance; insurance companies ranked first the comprehensive commercial vehicles insurance and contractors and consultants ranked first bid bond respectively.

Table 4.31: Ten most used insurance policies in the road construction industry

| NO. | CLIENT                                         | INSURANCE COMPANIES                         | CONSULTANTS                                    | CONTRACTORS                                    |
|-----|------------------------------------------------|---------------------------------------------|------------------------------------------------|------------------------------------------------|
| 1   | Contractor's all risk Insurance                | Comprehensive Commercial vehicles insurance | Bid bond                                       | Bid bond                                       |
| 2   | Bid bond                                       | Bid bond                                    | Performance bonds and Guarantees               | Performance bonds and Guarantees               |
| 3   | Performance bonds and Guarantees               | Plant and Equipment Insurance               | Contractor's all risk Insurance                | Contractor's all risks Insurance               |
| 4   | Plant and Equipment Insurance                  | Performance bonds and Guarantees            | Plant and Equipment Insurance                  | Plant and Equipment Insurance                  |
| 5   | Comprehensive Commercial vehicles              | Contractors all risk Insurance              | Fire perils insurance on premises and contents | Comprehensive Commercial vehicles              |
| 6   | Third party insurance                          | Goods in transit/Transport floater          | Comprehensive Commercial vehicles              | Goods in transit/Transport                     |
| 7   | Workers compensation                           | Workers compensation Insurance              | Goods in transit/Transport                     | Third party insurance                          |
| 8   | Fire perils insurance on premises And contents | Third party insurance                       | Professional Indemnity Insurance               | Workers compensation Insurance                 |
| 9   | Goods in transit/Transport floater             | Major Medical Insurance                     | Workers compensation Insurance                 | Fire perils insurance on premises and contents |
| 10  | Public liability Insurance                     | Employers' liability Insurance              | Public liability Insurance                     | Major Medical Insurance                        |

9. By using Kendall concordance test, the following factors as shown below were considered the ten major risk factors; the ten most used insurance policies and the ten most insurable risks. Accordingly, delay in payment to contractor for work done, injury to property and bid bond are ranked first risk factor, insurable risk and insurance policies respectively.

Table 4.32: Major risk factors, insurable risks and most used insurance policies (Using the Kendall concordance test).

| NO | Ten most important risk Factors              | Ten most important Insurable risks     | Ten most used insurance policies               |
|----|----------------------------------------------|----------------------------------------|------------------------------------------------|
| 1  | Delay in Payment to contractor for work done | Injury to property                     | Bid bond                                       |
| 2  | Shortage of materials in the market          | Theft                                  | Performance bonds and guarantee                |
| 3  | Shortage of liquidity                        | Strikes and labour disputes            | Contractor's all risk                          |
| 4  | Poor site management and supervision         | Materials damage during transportation | Plant and Equipment Insurance                  |
| 5  | Inadequate contractor experience             | Injury to person                       | Motor insurance to cover vehicles              |
| 6  | Delays in subcontractors work                | Heavy rain                             | Goods in transit/Transport floater             |
| 7  | Inadequate managerial skills                 | War                                    | Third party insurance                          |
| 8  | Unforeseen ground conditions                 | Fire                                   | Fire perils insurance on premises and contents |
| 9  | Fluctuations (changes in cost)               | Weather                                | Workers compensation insurance                 |
| 10 | Long waiting time for approval of drawings   | Earth quake                            | Employers' liability insurance                 |

## CHAPTER FIVE

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1. Introduction

The aim of this research as indicated in Chapter one is to conduct an investigation into how construction risk management is practiced and insurance is used as a risk transfer tool in the Ethiopian Federal road construction projects and to examine the interaction between construction contract parties and insurance companies with respect to risk management practices.

#### 5.2. Conclusions

The results obtained in the analysis of the questionnaires survey have been discussed and presented in the previous Chapter in detail. Therefore, based on the results from the analysis, the following major conclusions have been derived and summarized:

1. All respondents have some knowledge of risk management through reading and practice but the implementation level of risk management among respondents varies. Mainly, contractors and consultants understand risk management through reading and practice than the client and insurance companies.
2. The client (ERA) mainly uses the opinion of external consultants (design and supervision consultants) as the number one method of risk identification. The consultants and the contractors, on the other hand, mainly use site visit as the number one method of risk identification. By past experience or analysis of prior projects was ranked as second most used risk identification method by consultants and contractors.
3. Contractors mainly conduct risk analysis at the time of tendering. Most of the contract groups just add a percentage to budget/cost to cope up with uncertainties rather than implementing mathematical risk analysis tools to quantify risks.
4. Significant numbers of respondents have reservation on the proper risk allocation practices among contracting parties in the Federal Road Construction contracts due to lack of knowledge in the importance of proper risk management of construction projects.
5. The client, insurance companies, consultants and contractors have their individual

- preferences on the ranking of various risk factors in the road construction industry. Majority of participants in the road construction industry use “past experience/Analysis of prior projects” in the identification of risk factors in the road construction industry.
6. Most of the respondents have encountered accidents in the road construction projects they were involved, however; the contracting parties mainly provide insurance coverage to road projects to meet the demand of the client rather than to avoid possible risks.
  7. Though in the design and supervision contract terms of reference of the client the researcher has reviewed, it is clearly indicated that the consultants are required to provide the professional indemnity insurance equivalent with the contract amount and valid for the period of the service contract, majority of the design and supervision consultants involved in the road projects have confirmed that they do not have effective professional indemnity insurance for the service they deliver.
  8. The main problems/concerns identified with the provision of insurance in the road construction projects are mainly due to lack of knowledge in insurance and complex policy language of insurance to apply in the road construction industry.
  9. Most of the insurance companies surveyed in the study only provide insurance coverage to road projects but do not normally visit project site or educate other participant especially contractors how to control or minimize the occurrence of risks in the road construction projects.
  10. The interaction among the contract groups in the identification and management of risks with insurance companies is insignificant. As a result, it is noted that the insurance premium is fixed mainly based on the location of the project and the contract amount of the project.

### 5.3. Recommendations

The goal of all parties involved in the road construction projects as far as the study is concerned is to avert any risk that may impact the objectives of the project and to obtain the broadest insurance coverage, at the lowest cost, while ensuring minimum risk during the construction works with the implementation of appropriate risk management strategies. In order to achieve the above objectives, the following management strategies are recommended.

1. Right from the planning stage to the completion of a project, the client (ERA) is recommended to involve the various groups concerned that are the consultants, the contractors and the insurance companies in discussing the risk management process. This may include identification of risk, allocation, control and mitigation of those risks as well as the drafting of applicable insurance policies before and during construction.
2. The client is suggested to engage experts to ensure that insurance policies are specifically designed according to the nature of a project, the types of procurement and construction contract as well as its limitation and coverage than adopting standard policy words that are forwarded by the insurance companies. In addition, the arrangement of insurance by contractors and consultants might be revisited to implement effective insurance policies by shifting the responsibility of purchasing of insurance to the client (ERA) (i.e. Principal arranged insurance) as this enables the client to purchase insurance in bulk with lesser premium by procuring the insurances through competitive tendering process.
3. The client is recommended to reinforce the contract requirement of professional indemnity insurance for the service of consultants throughout the service period of a project. To this effect, the client (ERA) in collaboration with other concerned government and non-government bodies (consultants and contractors associations) is suggested to produce a common standard manual for construction insurance to be used by all stakeholders. The client is also recommended to review the Terms of References (TOR) for design and supervision services to include construction insurance expert services to give support during the design and supervision of road projects.
4. The design and supervision consultants involved in the Ethiopian Federal Road projects are recommended to protect their professionals and firms by providing adequate professional indemnity insurance coverage to the service they deliver from legal liabilities arising from their professional error, omissions and negligence of their

employees. Licensing authority for professional consultants are recommended to request for testimonials for performance of consultants of their service from employing agencies like ERA while the consultants are required to renew their license. It is also advised to make mandatory through regulation to hold professional indemnity insurance as a firm when any consultant requests for a new license from the concerned authority to give service in the construction industry in Ethiopia.

5. It is recommended to review the method of professional indemnity insurance cover as the researcher reviewed documents in consultancy service of road projects in Ethiopia follow simple method of calculation based on the service contract amount and the period of service. The insurance companies in collaboration with the client and consultants are advised to develop a manual based on risks assessed method that involved in the service and the works to fix the extent of the coverage.
6. While contractors are mainly responsible for successful risk management of projects, insurers can provide their expertise to assist consultants', contractors' and client's risk management endeavor in recognizing potential risks and reducing the probability of such risks. In order to reduce incidents and therefore claims, insurers are recommended to take an active attitude to assist the insured to control risks for works. To this effect, Insurance companies are suggested to assign experienced Engineers who are familiar with the type of projects, be experienced in risk identification and analysis processes and have the ability to recommend useful solutions to avert risks.
7. Due to complex characteristics of road construction projects, a construction project insurer's opportunity lies in the drafting, negotiating, and concluding of a bearable long term insurance agreements, it is therefore, necessary for construction insurers to get involved in the risk identification, allocation and drafting and negotiation of insurance policies before and during construction. As part of risk identification, Insurance companies are recommended to visit project sites at the early stage of construction projects and throughout the construction period rather than only when problems arise so that the insurer will be accustomed with the opportunity to keep in close contact with the risks of the project.
8. It is recommended to insurance companies to urge the government of Ethiopia (the National Bank of Ethiopia) on the prompt establishment of reinsuring companies in the country. The researcher has learnt that all local insurance companies are corresponding

with foreign reinsurers through foreign currency to share major construction insurance coverage. In the opinion of the researcher, this will have complexity in policy language and communication in addition to the impact on the amount of the premium.

9. Contractors are suggested to be innovative and have the ability to negotiate with the insurers to improve the conditions of the insurance policies, as well as, to obtain best premium reduction through implementing proper loss control and risk management measures by deploying experienced professionals in the area of risk management and insurance. Contractors are further recommended in the road construction industry to implement effective risk management system, safety management programs and quality control to alleviate risks and to maintain a good track record on their performance over the years on risk events on their projects.

#### **5.4. Recommendation for Future Research**

The researcher would like to suggest for future research that are related with this study are: developing a guideline for construction risk and insurance provision in road construction projects and special risk considerations in road projects in Ethiopia. It is believed that they will contribute towards a better understanding for both industries, i.e. the insurance industry and the construction industry to manage construction risks.

## References

- Abebe Dinku (Prof.Dr.ing.)(2000). Insurance Requirements and Practices of Ethiopia's Construction Sector; Zede, 17.
- Abrahamson, M. (1984). Risk Management. 2 ICLR 241.
- Akbiyikli, R. D. (2012). Insurance Issues and Design and Build Construction Contracts; e-Journal of New World Sciences Academy, 203-214.
- Akintoye, M. J. (1997). Risk Analysis and Management in Construction. International Journal of Project Management, 31-38.
- Allensworth, W. R. (1996). Risk Transfer in Construction Contracts: The Architects' and Engineers' Perspective; Partnering: Beyond the Basics, 1-12.
- Asnake, N. (2010). The Practice of Risk Management in Ethiopian Road Construction Projects; Reading University Msc Thesis on Construction Project Management
- Baartz, J. a. (2003). Construction and Infrastructure Projects Risk Management through Insurance; Allens Arthur Robinson.<http://www.aar.com.au/pubs/pdf/insur/ins6aug.pdf>.
- Baloi, D. (2012). Risk Analysis Techniques in Construction Engineering Projects; Journal of Risk Analysis and Crisis Response, 115-123.
- Berliner, B. (1985). Large Risks and Limits of Insurability; the Geneva Papers of Risks and Insurance, 313-329.
- Bezawit, T. F. (2010). Delivery of Quality Service by Engineering Consultants on Road Projects of Ethiopia; The University of Reading, School of Construction Management and Engineering.
- Bowen, P. J. (2005). Risk Management in Project Organizations; Elsevier Butterworth Heinemann.
- Brauers, W. (1986). Risk, Uncertainty and Risk Analysis; Long Range Planning, 139-143.
- BRITISH STANDARD, BS No. 4778, 1991, IEC 1025:1990
- Bunni, N. G. (2003). Risk and Insurance in Construction; London and Newyork: Spon Press.
- CACC, T. C. (2004). Insurance for Government Construction Projects Guidelines; New South Wales.
- Chapman, C. W. (2003). Constructively Simple, Estimating: A Project Management Example; Journal of the Operational Research Society, 1050-1058.
- CIC, C. I. (2008). Professional Indemnity Insurance for Construction Consultants; London: Construction Industry Council.
- CIDB, C. I. (2004). Managing Construction Procurement Risks; Pretoria: First Edition of CIDB

document 1005.

Commercial Code of the Empire of Ethiopia Proclamation No. 166 Of 1960

Cooper, D. G. (2005). Project Risk Management Guidelines: Managing Risk in Large Projects and Complex Procurements; John Wiley & Sons, Ltd.

ERA. (2013). Assessment of 16 Years Road Sector Development Program; Addis Ababa: Ethiopian Roads Authority.

ERA-SMEC, S. E. (2008). Claims and Disputes Resolution Manual; Addis Ababa: ERA.

Eschemuller, R. L. (2009). Construction Project Management; the McGraw-Hill Companies, Inc.

Fewings, P. (2005). Construction Project Management; London: Taylor & Francis.

FHWA, F. H. (2006). Guide to Risk Assessment and Allocation for Highway; American Association of State Highway and Transportation Officials.

FIDIC. (1986). Construction insurance and law; London, UK: FIDIC by Rhys Jones Consultants.

Flanagan, R. a. (1993). Risk management and Construction; Black well science Ltd.

Gould, N. (2003). Insurance; Fenwick Elliott, the Construction & Energy Specialists, 29;

Hughes, J. M. (2000). Construction Contracts Law and Management; Third edition published by Spon Press.

IRM. (2002). A Risk Management Standard; the Institute of Risk Management.

Judy F. Anderson, R. L. (2005). Risk and Insurance; the Society of Actuaries, Copyright 2005 by the Society of Actuaries Printed in U.S.A.

Junying, L. (2006). Insurance and Construction Project Risks: A Review and Research Agenda; School of Management, Tianjin University.

Karen, L. (2011). The Insuring Agreement: Key Concepts of Fortuity, Accident, Occurrence and Property Damage; Insurance Law Conference 2011.

Keith, R. M. (2006). Risk Assessment and Allocation for Highway Construction Management. Federal Highway Administration, American Association of State Highway and National Cooperative Highway.

Kleim, R. a. (1998). Project Management Practitioner's Handbook; New York: AMACOM.

Kuang, Z. (2010). Risk Management in Construction Projects. Denmark: VIA University College, Horsens Campus, Denmark.

Kumaraswamy, M. R. (2001). Revamping Risk Management in Hong Kong Construction Industry; Construction & Building research Conference, 9.

- Mead, P. (2007). Construction Projects Risk Management; Construction Law Journal, 23-45.
- Melese, M. (2006). Role of Financial Institutions for the Ethiopia Construction Industry; Addis Ababa: Addis Ababa University, AAIT.
- Nadeem, E. M. (2010). Risk Management in construction industry; IEEE, 6.
- Naoum, S. (1998). Dissertation Research and Writing for Construction Students; Oxford, UK: Butterworth-Heinemann.
- Norman, R. F. (1993). Risk Management and Construction; Blackwell Science.
- (NCHRP), N. C. (2009). Research Report for Guidebook on Risk Analysis Tools and Management; The University of Colorado Texas A&M University.
- Norton, R. (2010). Bonds and Guarantees, <http://www.foams.saint-gobain.com/uploadedFiles/SGfoams/Documents pdf>.
- (OSPMI), O. (2007). Project Risk Management Handbook; California: Office of Statewide Project Management Improvement (OSPMI).
- Palmer, W. J. (1996). Construction insurance, bonding, and risk management. New: McGraw-Hill Professional.
- Pankaj V. Naphade, P. P. (2013). To Study on the Risk Management, Risk Treatment Strategies and Insurance in Construction Industries; International Journal of Innovative Technology and Exploring Engineering (IJITEE), 68-74.
- PMBOK. (2013). Construction Extension to A Guide to the Project Management Body of Knowledge. Project Management Institute.
- Premaraj, B. (2005). Risk Identification and Allocation – A Necessary Step.
- Pritchett, S. e. (1996). Risk Management and Insurance. West Publishing Company.
- Raftery, J. (1994). RISK ANALYSIS IN PROJECT MANAGEMENT. Spon Press.
- Rahman, C. S. (2013). The Identification and Management of Major Risks in the Malaysian Construction Industry; Journal of Construction in Developing Countries, 19–32.
- Ratterman, D. B. (2003); Managing Risk: Insurance and Indemnity Clauses in Construction Contracts; North American Steel Construction Conference.
- The Emperor of Ethiopia the Civil Code of Ethiopia (1960).
- The Emperor of Ethiopia the Commercial Code of Ethiopia (1960).
- Thomson, P. a. (1992). Engineering Construction Risks; London: Thomas Telford.
- Touran, A. (2006). Owners Risk Reduction Techniques Using a CM; Department of Civil &

Environmental Engineering.

Turkey W. (2011). Risk Factors Leading to Cost Overrun in Ethiopian Federal Road Construction Projects and Its Consequences; Addis Ababa: Addis Ababa University; AAiT.

Zelege, H. (2007). Insurance in Ethiopia, Historical Development, Present Status and Future Challenges; Addis Ababa: @ Hailu Zelege.

Zerfu Tessema. (2009). Challenges in ERA Road Construction Projects; Addis Ababa: Ethiopian Roads Authority.

## Appendices

## Appendix-1: Ranking of Risk Factors in the Road Construction Industry

### 1.1: Client Ranking of Risk Factors in the Road Construction Industry

| NO. | RISK FACTORS IN CONSTRUCTION                           | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|-----|--------------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|     |                                                        | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1   | Permits delayed or take longer than expected           | 1     | 4 | 4 | 1 | 0 | 0.5                       | 22   |
| 2   | Pressure to deliver project on an accelerated schedule | 4     | 3 | 2 | 1 | 0 | 0.4                       | 42   |
| 3   | Low productivity                                       | 1     | 4 | 3 | 1 | 1 | 0.54                      | 13   |
| 4   | Labour shortage                                        | 2     | 3 | 4 | 1 | 0 | 0.48                      | 25   |
| 5   | Strikes and labour disputes                            | 1     | 3 | 2 | 2 | 2 | 0.62                      | 7    |
| 6   | Change orders/Variations                               | 2     | 3 | 3 | 1 | 1 | 0.52                      | 17   |
| 7   | Unforeseen ground conditions                           | 3     | 1 | 3 | 2 | 1 | 0.54                      | 13   |
| 8   | Inappropriate type of foundation                       | 3     | 4 | 3 | 0 | 0 | 0.4                       | 42   |
| 9   | Errors in drawings                                     | 2     | 3 | 1 | 2 | 0 | 0.38                      | 45   |
| 10  | Location and project restriction                       | 2     | 5 | 1 | 1 | 1 | 0.48                      | 25   |
| 11  | Fluctuations (changes in cost)                         | 1     | 2 | 4 | 2 | 1 | 0.6                       | 8    |
| 12  | Long waiting time for approval of drawings             | 3     | 1 | 2 | 3 | 1 | 0.56                      | 10   |
| 13  | Unrealistic contract duration                          | 3     | 4 | 2 | 1 | 0 | 0.42                      | 36   |
| 14  | Delay in Payment to contractor for work done           | 0     | 0 | 2 | 4 | 4 | 0.84                      | 1    |
| 15  | Inadequate client experience                           | 4     | 2 | 1 | 2 | 1 | 0.48                      | 25   |
| 16  | Delay in design information                            | 2     | 3 | 2 | 2 | 1 | 0.54                      | 13   |
| 17  | Mistakes and discrepancies in design documents         | 2     | 2 | 3 | 3 | 0 | 0.54                      | 13   |
| 18  | Inadequate design team experience                      | 4     | 1 | 2 | 2 | 1 | 0.5                       | 22   |
| 19  | Long waiting time for approval of test samples         | 2     | 4 | 2 | 1 | 1 | 0.5                       | 22   |
| 20  | Injury to persons                                      | 5     | 1 | 2 | 2 | 1 | 0.52                      | 17   |
| 21  | Injury to property                                     | 4     | 3 | 1 | 2 | 0 | 0.42                      | 36   |
| 22  | Damages and delays during construction                 | 1     | 3 | 2 | 4 | 0 | 0.58                      | 9    |
| 23  | Contractor failure to enter into contract              | 4     | 2 | 1 | 2 | 1 | 0.48                      | 25   |
| 24  | Shortage of materials in market                        | 0     | 2 | 1 | 4 | 3 | 0.76                      | 2    |
| 25  | Inaccurate materials estimating                        | 3     | 1 | 3 | 3 | 0 | 0.52                      | 17   |
| 26  | Poor site management and supervision                   | 0     | 1 | 3 | 4 | 2 | 0.74                      | 3    |
| 27  | Inadequate contractor experience                       | 1     | 1 | 3 | 4 | 1 | 0.66                      | 5    |
| 28  | Inadequate managerial skills                           | 1     | 0 | 4 | 4 | 1 | 0.68                      | 4    |
| 29  | Defective work that must be removed and replaced       | 4     | 2 | 1 | 3 | 0 | 0.46                      | 30   |
| 30  | Delays in subcontractors work                          | 3     | 1 | 2 | 3 | 1 | 0.56                      | 10   |
| 31  | Shortage of liquidity                                  | 1     | 2 | 4 | 0 | 3 | 0.64                      | 6    |
| 32  | Shortage of plant/equipment                            | 1     | 4 | 3 | 2 | 0 | 0.52                      | 17   |
| 33  | Inaccurate prediction of equipment production output   | 3     | 1 | 3 | 3 | 0 | 0.52                      | 17   |
| 34  | Weather                                                | 4     | 2 | 3 | 1 | 0 | 0.42                      | 36   |
| 35  | Fire                                                   | 2     | 5 | 1 | 2 | 0 | 0.46                      | 30   |
| 36  | Earth quake                                            | 6     | 3 | 1 | 0 | 0 | 0.3                       | 50   |
| 37  | War                                                    | 5     | 1 | 4 | 0 | 0 | 0.38                      | 45   |
| 38  | Nuclear weapons material                               | 3     | 4 | 2 | 1 | 0 | 0.42                      | 36   |
| 39  | Radioactive materials                                  | 2     | 5 | 1 | 2 | 0 | 0.46                      | 30   |
| 40  | Extraordinary wind                                     | 4     | 2 | 3 | 0 | 1 | 0.44                      | 33   |
| 41  | Heavy rain                                             | 3     | 3 | 2 | 1 | 0 | 0.38                      | 45   |
| 42  | Frequent changes in law                                | 4     | 2 | 1 | 2 | 1 | 0.48                      | 25   |
| 43  | Exchange rate fluctuation                              | 5     | 2 | 3 | 0 | 0 | 0.36                      | 48   |
| 44  | Financial problem due to errors in Estimation          | 3     | 4 | 2 | 0 | 1 | 0.44                      | 33   |
| 45  | Insufficient insurance                                 | 4     | 2 | 3 | 1 | 0 | 0.42                      | 36   |
| 46  | Theft                                                  | 6     | 2 | 2 | 0 | 0 | 0.32                      | 49   |
| 47  | Materials damage during transportation                 | 4     | 2 | 3 | 1 | 0 | 0.42                      | 36   |
| 48  | Interference by client                                 | 3     | 4 | 2 | 0 | 1 | 0.44                      | 33   |
| 49  | Poor construction method                               | 1     | 3 | 4 | 1 | 1 | 0.56                      | 10   |
| 50  | Low productivity of subcontractors                     | 4     | 3 | 2 | 1 | 0 | 0.4                       | 42   |

**1.2: Consultants Ranking of Risk Factors in the Road Construction Industry**

| NO. | RISK FACTORS IN CONSTRUCTION                           | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|-----|--------------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|     |                                                        | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1   | Permits delayed or take longer than expected           | 2     | 3 | 4 | 1 | 0 | 0.48                      | 23   |
| 2   | Pressure to deliver project on an accelerated schedule | 5     | 2 | 2 | 1 | 0 | 0.38                      | 44   |
| 3   | Low productivity                                       | 2     | 3 | 3 | 1 | 1 | 0.52                      | 17   |
| 4   | Labour shortage                                        | 3     | 2 | 4 | 1 | 0 | 0.46                      | 28   |
| 5   | Strikes and labour disputes                            | 6     | 3 | 1 | 0 | 0 | 0.3                       | 49   |
| 6   | Change orders/Variations                               | 2     | 3 | 5 | 0 | 0 | 0.46                      | 28   |
| 7   | Unforeseen ground conditions                           | 1     | 4 | 2 | 1 | 2 | 0.58                      | 9    |
| 8   | Inappropriate type of foundation                       | 3     | 1 | 3 | 2 | 1 | 0.54                      | 14   |
| 9   | Errors in drawings                                     | 3     | 4 | 1 | 2 | 0 | 0.44                      | 33   |
| 10  | Location and project restriction                       | 2     | 5 | 1 | 1 | 1 | 0.48                      | 23   |
| 11  | Fluctuations (changes in cost)                         | 0     | 3 | 4 | 2 | 1 | 0.62                      | 7    |
| 12  | Long waiting time for approval of drawings             | 3     | 1 | 2 | 3 | 1 | 0.56                      | 10   |
| 13  | Unrealistic contract duration                          | 3     | 4 | 2 | 1 | 0 | 0.42                      | 36   |
| 14  | Delay in Payment to contractor for work done           | 0     | 1 | 1 | 4 | 4 | 0.82                      | 1    |
| 15  | Inadequate client experience                           | 4     | 2 | 1 | 2 | 1 | 0.48                      | 23   |
| 16  | Delay in design information                            | 2     | 3 | 2 | 2 | 1 | 0.54                      | 14   |
| 17  | Mistakes and discrepancies in design documents         | 1     | 4 | 2 | 3 | 0 | 0.54                      | 14   |
| 18  | Inadequate design team experience                      | 4     | 1 | 2 | 2 | 1 | 0.5                       | 21   |
| 19  | Long waiting time for approval of test samples         | 2     | 4 | 2 | 1 | 1 | 0.5                       | 21   |
| 20  | Injury to persons                                      | 3     | 2 | 3 | 2 | 1 | 0.58                      | 9    |
| 21  | Injury to property                                     | 4     | 3 | 1 | 2 | 0 | 0.42                      | 36   |
| 22  | Damages and delays during construction                 | 0     | 5 | 2 | 3 | 0 | 0.56                      | 11   |
| 23  | Contractor failure to enter into contract              | 4     | 2 | 1 | 2 | 1 | 0.48                      | 23   |
| 24  | Shortage of materials in market                        | 0     | 2 | 1 | 4 | 3 | 0.76                      | 2    |
| 25  | Inaccurate materials estimating                        | 3     | 1 | 3 | 3 | 0 | 0.52                      | 17   |
| 26  | Poor site management and supervision                   | 0     | 1 | 3 | 4 | 2 | 0.74                      | 3    |
| 27  | Inadequate contractor experience                       | 1     | 1 | 3 | 4 | 1 | 0.66                      | 5    |
| 28  | Inadequate managerial skills                           | 1     | 1 | 4 | 3 | 1 | 0.64                      | 6    |
| 29  | Defective work that must be removed and replaced       | 4     | 2 | 1 | 3 | 0 | 0.46                      | 28   |
| 30  | Delays in subcontractors work                          | 2     | 1 | 3 | 3 | 1 | 0.6                       | 8    |
| 31  | Shortage of liquidity                                  | 0     | 2 | 5 | 0 | 3 | 0.68                      | 4    |
| 32  | Shortage of plant/equipment                            | 1     | 4 | 3 | 2 | 0 | 0.52                      | 17   |
| 33  | Inaccurate prediction of equipment production output   | 3     | 1 | 3 | 3 | 0 | 0.52                      | 17   |
| 34  | Weather                                                | 4     | 2 | 3 | 1 | 0 | 0.42                      | 36   |
| 35  | Fire                                                   | 2     | 5 | 1 | 2 | 0 | 0.46                      | 28   |
| 36  | Earth quake                                            | 6     | 3 | 1 | 0 | 0 | 0.3                       | 49   |
| 37  | War                                                    | 5     | 1 | 4 | 0 | 0 | 0.38                      | 44   |
| 38  | Nuclear weapons material                               | 3     | 4 | 2 | 1 | 0 | 0.42                      | 36   |
| 39  | Radioactive materials                                  | 2     | 5 | 1 | 2 | 0 | 0.46                      | 28   |
| 40  | Extraordinary wind                                     | 4     | 2 | 3 | 0 | 1 | 0.44                      | 33   |
| 41  | Heavy rain                                             | 3     | 3 | 2 | 1 | 0 | 0.38                      | 44   |
| 42  | Frequent changes in law                                | 4     | 2 | 1 | 2 | 1 | 0.48                      | 23   |
| 43  | Exchange rate fluctuation                              | 5     | 2 | 3 | 0 | 0 | 0.36                      | 47   |
| 44  | Financial problem due to errors in Estimation          | 3     | 4 | 2 | 0 | 1 | 0.44                      | 33   |
| 45  | Insufficient insurance                                 | 4     | 2 | 3 | 1 | 0 | 0.42                      | 36   |
| 46  | Theft                                                  | 6     | 2 | 2 | 0 | 0 | 0.32                      | 48   |
| 47  | Materials damage during transportation                 | 4     | 2 | 3 | 1 | 0 | 0.42                      | 36   |
| 48  | Interference by client                                 | 3     | 4 | 2 | 1 | 0 | 0.42                      | 36   |
| 49  | Poor construction method                               | 1     | 3 | 4 | 1 | 1 | 0.56                      | 11   |
| 50  | Low productivity of subcontractors                     | 4     | 2 | 3 | 1 | 0 | 0.42                      | 36   |

**1.3: Insurance Companies Ranking of Risk Factors in the Road Construction Industry**

| NO | RISK FACTORS IN CONSTRUCTION                           | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|----|--------------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|    |                                                        | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1  | Permits delayed or take longer than expected           | 3     | 4 | 5 | 1 | 0 | 0.46                      | 26   |
| 2  | Pressure to deliver project on an accelerated schedule | 6     | 3 | 2 | 2 | 0 | 0.40                      | 45   |
| 3  | Low productivity                                       | 3     | 4 | 4 | 1 | 1 | 0.49                      | 20   |
| 4  | Labour shortage                                        | 4     | 4 | 4 | 1 | 0 | 0.43                      | 36   |
| 5  | Strikes and labour disputes                            | 2     | 4 | 2 | 3 | 2 | 0.58                      | 8    |
| 6  | Change orders/Variations                               | 0     | 4 | 6 | 2 | 1 | 0.60                      | 7    |
| 7  | Unforeseen ground conditions                           | 2     | 4 | 3 | 3 | 1 | 0.55                      | 10   |
| 8  | Inappropriate type of foundation                       | 0     | 4 | 3 | 5 | 1 | 0.65                      | 4    |
| 9  | Errors in drawings                                     | 4     | 5 | 2 | 2 | 0 | 0.43                      | 36   |
| 10 | Location and project restriction                       | 3     | 6 | 2 | 1 | 1 | 0.46                      | 26   |
| 11 | Fluctuations (changes in cost)                         | 1     | 4 | 5 | 2 | 1 | 0.57                      | 9    |
| 12 | Long waiting time for approval of drawings             | 2     | 4 | 3 | 3 | 1 | 0.55                      | 10   |
| 13 | Unrealistic contract duration                          | 4     | 5 | 3 | 1 | 0 | 0.42                      | 40   |
| 14 | Delay in Payment to contractor for work done           | 0     | 1 | 2 | 5 | 5 | 0.82                      | 1    |
| 15 | Inadequate client experience                           | 6     | 2 | 2 | 2 | 1 | 0.45                      | 29   |
| 16 | Delay in design information                            | 3     | 4 | 3 | 2 | 1 | 0.51                      | 18   |
| 17 | Mistakes and discrepancies in design documents         | 3     | 2 | 4 | 3 | 1 | 0.55                      | 10   |
| 18 | Inadequate design team experience                      | 5     | 2 | 3 | 2 | 1 | 0.48                      | 25   |
| 19 | Long waiting time for approval of test samples         | 3     | 5 | 2 | 1 | 2 | 0.51                      | 18   |
| 20 | Injury to persons                                      | 4     | 3 | 4 | 2 | 1 | 0.54                      | 15   |
| 21 | Injury to property                                     | 5     | 3 | 2 | 3 | 0 | 0.45                      | 29   |
| 22 | Damages and delays during construction                 | 2     | 4 | 3 | 4 | 0 | 0.54                      | 15   |
| 23 | Contractor failure to enter into contract              | 5     | 3 | 2 | 2 | 1 | 0.46                      | 26   |
| 24 | Shortage of materials in market                        | 0     | 3 | 2 | 5 | 3 | 0.72                      | 2    |
| 25 | Inaccurate materials estimating                        | 4     | 2 | 4 | 3 | 0 | 0.49                      | 20   |
| 26 | Poor site management and supervision                   | 0     | 3 | 3 | 5 | 2 | 0.69                      | 3    |
| 27 | Inadequate contractor experience                       | 3     | 3 | 2 | 4 | 1 | 0.55                      | 10   |
| 28 | Inadequate managerial skills                           | 2     | 1 | 5 | 4 | 1 | 0.62                      | 6    |
| 29 | Defective work that must be removed and replaced       | 5     | 3 | 2 | 3 | 0 | 0.45                      | 29   |
| 30 | Delays in subcontractors work                          | 3     | 2 | 4 | 3 | 1 | 0.55                      | 10   |
| 31 | Shortage of liquidity                                  | 1     | 3 | 5 | 1 | 3 | 0.63                      | 5    |
| 32 | Shortage of plant/equipment                            | 2     | 5 | 4 | 2 | 0 | 0.49                      | 20   |
| 33 | Inaccurate prediction of equipment production output   | 4     | 2 | 4 | 3 | 0 | 0.49                      | 20   |
| 34 | Weather                                                | 5     | 3 | 3 | 1 | 1 | 0.45                      | 29   |
| 35 | Fire                                                   | 3     | 6 | 2 | 2 | 0 | 0.45                      | 29   |
| 36 | Earth quake                                            | 7     | 4 | 1 | 1 | 0 | 0.34                      | 49   |
| 37 | War                                                    | 6     | 2 | 5 | 0 | 0 | 0.38                      | 46   |
| 38 | Nuclear weapons material                               | 4     | 5 | 3 | 1 | 0 | 0.42                      | 40   |
| 39 | Radioactive materials                                  | 3     | 6 | 2 | 2 | 0 | 0.45                      | 29   |
| 40 | Extraordinary wind                                     | 5     | 3 | 4 | 0 | 1 | 0.43                      | 36   |
| 41 | Heavy rain                                             | 4     | 4 | 3 | 1 | 0 | 0.38                      | 46   |
| 42 | Frequent changes in law                                | 5     | 3 | 1 | 2 | 2 | 0.49                      | 20   |
| 43 | Exchange rate fluctuation                              | 6     | 3 | 4 | 0 | 0 | 0.37                      | 48   |
| 44 | Financial problem due to errors in Estimation          | 4     | 5 | 3 | 0 | 1 | 0.43                      | 36   |
| 45 | Insufficient insurance                                 | 5     | 3 | 4 | 1 | 0 | 0.42                      | 40   |
| 46 | Theft                                                  | 7     | 3 | 3 | 0 | 0 | 0.34                      | 49   |
| 47 | Materials damage during transportation                 | 5     | 2 | 4 | 2 | 0 | 0.45                      | 29   |
| 48 | Interference by client                                 | 4     | 5 | 3 | 1 | 0 | 0.42                      | 40   |
| 49 | Poor construction method                               | 2     | 4 | 5 | 1 | 1 | 0.52                      | 17   |
| 50 | Low productivity of subcontractors                     | 5     | 3 | 4 | 1 | 0 | 0.42                      | 40   |

**1.4: Contractors Ranking of Risk Factors in the Road Construction Industry**

| NO. | RISK FACTORS IN CONSTRUCTION                           | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|-----|--------------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|     |                                                        | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1   | Permits delayed or take longer than expected           | 1     | 4 | 5 | 2 | 0 | 0.53                      | 18   |
| 2   | Pressure to deliver project on an accelerated schedule | 5     | 3 | 1 | 2 | 1 | 0.45                      | 37   |
| 3   | Low productivity                                       | 1     | 1 | 3 | 5 | 2 | 0.70                      | 4    |
| 4   | Labour shortage                                        | 2     | 1 | 3 | 2 | 4 | 0.68                      | 5    |
| 5   | Strikes and labour disputes                            | 0     | 3 | 5 | 4 | 0 | 0.62                      | 9    |
| 6   | Change orders/Variations                               | 4     | 2 | 2 | 2 | 2 | 0.53                      | 18   |
| 7   | Unforeseen ground conditions                           | 1     | 2 | 3 | 4 | 2 | 0.67                      | 6    |
| 8   | Inappropriate type of foundation                       | 3     | 2 | 4 | 2 | 1 | 0.53                      | 18   |
| 9   | Errors in drawings                                     | 0     | 3 | 5 | 3 | 1 | 0.63                      | 8    |
| 10  | Location and project restriction                       | 2     | 3 | 3 | 2 | 2 | 0.58                      | 13   |
| 11  | Fluctuations (changes in cost)                         | 4     | 2 | 3 | 1 | 2 | 0.52                      | 25   |
| 12  | Long waiting time for approval of drawings             | 1     | 3 | 5 | 2 | 1 | 0.58                      | 13   |
| 13  | Unrealistic contract duration                          | 5     | 3 | 1 | 2 | 1 | 0.45                      | 37   |
| 14  | Delay in Payment to contractor for work done           | 0     | 2 | 3 | 3 | 4 | 0.75                      | 2    |
| 15  | Inadequate client experience                           | 6     | 3 | 2 | 1 | 0 | 0.37                      | 49   |
| 16  | Delay in design information                            | 1     | 4 | 5 | 2 | 0 | 0.53                      | 18   |
| 17  | Mistakes and discrepancies in design documents         | 2     | 2 | 4 | 3 | 1 | 0.58                      | 13   |
| 18  | Inadequate design team experience                      | 0     | 3 | 5 | 2 | 2 | 0.65                      | 7    |
| 19  | Long waiting time for approval of test samples         | 6     | 2 | 1 | 3 | 0 | 0.42                      | 41   |
| 20  | Injury to persons                                      | 4     | 4 | 3 | 0 | 1 | 0.43                      | 39   |
| 21  | Injury to property                                     | 3     | 5 | 2 | 1 | 1 | 0.47                      | 31   |
| 22  | Damages and delays during construction                 | 2     | 4 | 3 | 2 | 1 | 0.53                      | 18   |
| 23  | Contractor failure to enter into contract              | 4     | 2 | 4 | 1 | 1 | 0.48                      | 27   |
| 24  | Shortage of materials in market                        | 1     | 3 | 5 | 0 | 2 | 0.53                      | 18   |
| 25  | Inaccurate materials estimating                        | 2     | 5 | 3 | 2 | 0 | 0.48                      | 27   |
| 26  | Poor site management and supervision                   | 4     | 6 | 0 | 1 | 1 | 0.42                      | 41   |
| 27  | Inadequate contractor experience                       | 2     | 0 | 4 | 3 | 2 | 0.60                      | 10   |
| 28  | Inadequate managerial skills                           | 3     | 4 | 3 | 1 | 1 | 0.48                      | 27   |
| 29  | Defective work that must be removed and replaced       | 2     | 1 | 5 | 3 | 1 | 0.60                      | 10   |
| 30  | Delays in subcontractors work                          | 2     | 1 | 1 | 4 | 4 | 0.72                      | 3    |
| 31  | Shortage of liquidity                                  | 0     | 1 | 3 | 3 | 5 | 0.80                      | 1    |
| 32  | Shortage of plant/equipment                            | 2     | 5 | 1 | 2 | 2 | 0.55                      | 16   |
| 33  | Inaccurate prediction of equipment production output   | 2     | 6 | 2 | 2 | 0 | 0.47                      | 31   |
| 34  | Weather                                                | 1     | 3 | 4 | 3 | 1 | 0.60                      | 10   |
| 35  | Fire                                                   | 4     | 2 | 4 | 2 | 0 | 0.47                      | 31   |
| 36  | Earth quake                                            | 6     | 3 | 1 | 1 | 1 | 0.40                      | 45   |
| 37  | War                                                    | 2     | 5 | 3 | 2 | 0 | 0.48                      | 27   |
| 38  | Nuclear weapons material                               | 7     | 3 | 1 | 1 | 0 | 0.33                      | 50   |
| 39  | Radioactive materials                                  | 4     | 3 | 5 | 0 | 0 | 0.42                      | 41   |
| 40  | Extraordinary wind                                     | 3     | 5 | 2 | 1 | 1 | 0.47                      | 31   |
| 41  | Heavy rain                                             | 4     | 2 | 4 | 2 | 0 | 0.47                      | 31   |
| 42  | Frequent changes in law                                | 3     | 5 | 3 | 1 | 0 | 0.43                      | 39   |
| 43  | Exchange rate fluctuation                              | 6     | 3 | 2 | 0 | 1 | 0.38                      | 47   |
| 44  | Financial problem due to errors in Estimation          | 2     | 4 | 3 | 2 | 1 | 0.53                      | 18   |
| 45  | Insufficient insurance                                 | 4     | 3 | 5 | 0 | 0 | 0.42                      | 41   |
| 46  | Theft                                                  | 7     | 2 | 1 | 1 | 1 | 0.38                      | 47   |
| 47  | Materials damage during transportation                 | 4     | 3 | 2 | 3 | 0 | 0.47                      | 31   |
| 48  | Interference by client                                 | 5     | 4 | 2 | 0 | 1 | 0.40                      | 45   |
| 49  | Poor construction method                               | 2     | 4 | 4 | 1 | 1 | 0.52                      | 25   |
| 50  | Low productivity of subcontractors                     | 3     | 3 | 2 | 2 | 2 | 0.55                      | 16   |

**1.5: Weighted Average and Ranking for Respondents on Risk Factors in Construction**

| NO. | RISK FACTORS IN CONSTRUCTION                           | CLIENT<br>RII | CONSULTANTS<br>RII | INSURANCE<br>COMPANY<br>RII | CONTRACTORS<br>RII | WEIGHTED<br>AVERAGE | RANK |
|-----|--------------------------------------------------------|---------------|--------------------|-----------------------------|--------------------|---------------------|------|
| 1   | Permits delayed or take longer than expected           | 0.5           | 0.48               | 0.46                        | 0.53               | 0.49                | 26   |
| 2   | Pressure to deliver project on an accelerated schedule | 0.4           | 0.38               | 0.40                        | 0.45               | 0.41                | 44   |
| 3   | Low productivity                                       | 0.54          | 0.52               | 0.49                        | 0.70               | 0.56                | 12   |
| 4   | Labour shortage                                        | 0.48          | 0.46               | 0.43                        | 0.68               | 0.51                | 22   |
| 5   | Strikes and labour disputes                            | 0.62          | 0.3                | 0.58                        | 0.62               | 0.53                | 17   |
| 6   | Change orders/Variations                               | 0.52          | 0.46               | 0.60                        | 0.53               | 0.53                | 19   |
| 7   | Unforeseen ground conditions                           | 0.54          | 0.6                | 0.55                        | 0.67               | 0.59                | 8    |
| 8   | Inappropriate type of foundation                       | 0.4           | 0.58               | 0.65                        | 0.53               | 0.54                | 15   |
| 9   | Errors in drawings                                     | 0.38          | 0.44               | 0.43                        | 0.63               | 0.47                | 32   |
| 10  | Location and project restriction                       | 0.48          | 0.48               | 0.46                        | 0.58               | 0.50                | 24   |
| 11  | Fluctuations (changes in cost)                         | 0.6           | 0.62               | 0.57                        | 0.52               | 0.58                | 9    |
| 12  | Long waiting time for approval of drawings             | 0.56          | 0.56               | 0.55                        | 0.58               | 0.56                | 10   |
| 13  | Unrealistic contract duration                          | 0.42          | 0.42               | 0.42                        | 0.45               | 0.43                | 41   |
| 14  | Delay in Payment to contractor for work done           | 0.84          | 0.82               | 0.82                        | 0.75               | 0.81                | 1    |
| 15  | Inadequate client experience                           | 0.48          | 0.48               | 0.45                        | 0.37               | 0.44                | 38   |
| 16  | Delay in design information                            | 0.54          | 0.54               | 0.51                        | 0.53               | 0.53                | 18   |
| 17  | Mistakes and discrepancies in design documents         | 0.54          | 0.58               | 0.55                        | 0.58               | 0.56                | 10   |
| 18  | Inadequate design team experience                      | 0.5           | 0.5                | 0.48                        | 0.65               | 0.53                | 16   |
| 19  | Long waiting time for approval of test samples         | 0.5           | 0.5                | 0.51                        | 0.42               | 0.48                | 28   |
| 20  | Injury to persons                                      | 0.52          | 0.58               | 0.54                        | 0.43               | 0.52                | 21   |
| 21  | Injury to property                                     | 0.42          | 0.42               | 0.45                        | 0.47               | 0.44                | 39   |
| 22  | Damages and delays during construction                 | 0.58          | 0.58               | 0.54                        | 0.53               | 0.56                | 13   |
| 23  | Contractor failure to enter into contract              | 0.48          | 0.48               | 0.46                        | 0.48               | 0.48                | 29   |
| 24  | Shortage of materials in market                        | 0.76          | 0.76               | 0.72                        | 0.53               | 0.69                | 2    |
| 25  | Inaccurate materials estimating                        | 0.52          | 0.52               | 0.49                        | 0.48               | 0.50                | 23   |
| 26  | Poor site management and supervision                   | 0.74          | 0.74               | 0.69                        | 0.42               | 0.65                | 4    |
| 27  | Inadequate contractor experience                       | 0.66          | 0.66               | 0.55                        | 0.60               | 0.62                | 5    |
| 28  | Inadequate managerial skills                           | 0.68          | 0.64               | 0.62                        | 0.48               | 0.60                | 7    |
| 29  | Defective work that must be removed & replaced         | 0.46          | 0.46               | 0.45                        | 0.60               | 0.49                | 27   |
| 30  | Delays in subcontractors work                          | 0.56          | 0.6                | 0.55                        | 0.72               | 0.61                | 6    |
| 31  | Shortage of liquidity                                  | 0.64          | 0.68               | 0.63                        | 0.80               | 0.69                | 3    |
| 32  | Shortage of plant/equipment                            | 0.52          | 0.52               | 0.49                        | 0.55               | 0.52                | 20   |
| 33  | Inaccurate prediction of equipment production output   | 0.52          | 0.52               | 0.49                        | 0.47               | 0.50                | 25   |
| 34  | Weather                                                | 0.42          | 0.42               | 0.45                        | 0.60               | 0.47                | 30   |
| 35  | Fire                                                   | 0.46          | 0.46               | 0.45                        | 0.47               | 0.46                | 34   |
| 36  | Earth quake                                            | 0.3           | 0.3                | 0.34                        | 0.40               | 0.33                | 50   |
| 37  | War                                                    | 0.38          | 0.38               | 0.38                        | 0.48               | 0.41                | 45   |
| 38  | Nuclear weapons material                               | 0.42          | 0.42               | 0.42                        | 0.33               | 0.40                | 47   |
| 39  | Radioactive materials                                  | 0.46          | 0.46               | 0.45                        | 0.42               | 0.45                | 36   |
| 40  | Extraordinary wind                                     | 0.44          | 0.44               | 0.43                        | 0.47               | 0.44                | 37   |
| 41  | Heavy rain                                             | 0.38          | 0.38               | 0.38                        | 0.47               | 0.40                | 46   |
| 42  | Frequent changes in law                                | 0.48          | 0.48               | 0.49                        | 0.43               | 0.47                | 31   |
| 43  | Exchange rate fluctuation                              | 0.36          | 0.36               | 0.37                        | 0.38               | 0.37                | 48   |
| 44  | Financial problem due to errors in Estimation          | 0.44          | 0.44               | 0.43                        | 0.53               | 0.46                | 33   |
| 45  | Insufficient insurance                                 | 0.42          | 0.42               | 0.42                        | 0.42               | 0.42                | 43   |
| 46  | Theft                                                  | 0.32          | 0.32               | 0.34                        | 0.38               | 0.34                | 49   |
| 47  | Materials damage during transportation                 | 0.42          | 0.42               | 0.45                        | 0.47               | 0.44                | 39   |
| 48  | Interference by client                                 | 0.44          | 0.42               | 0.42                        | 0.40               | 0.42                | 42   |
| 49  | Poor construction method                               | 0.56          | 0.56               | 0.52                        | 0.52               | 0.54                | 14   |
| 50  | Low productivity of subcontractors                     | 0.4           | 0.42               | 0.42                        | 0.55               | 0.45                | 35   |

## Appendix-2: Insurable and Uninsurable Risks in the Road Construction Industry

### 2.1. Client's Ranking of Insurable and Uninsurable Risks

| NO. | RISK FACTORS IN CONSTRUCTION                           | CLIENT                         |             |                                  |             |
|-----|--------------------------------------------------------|--------------------------------|-------------|----------------------------------|-------------|
|     |                                                        | No. of Responses for insurable | % Responses | No. of Responses for uninsurable | % Responses |
| 1   | Permits delayed or take longer than expected           | 2                              | 20          | 8                                | 80          |
| 2   | Pressure to deliver project on an accelerated schedule | 3                              | 30          | 7                                | 70          |
| 3   | Low productivity                                       | 1                              | 10          | 9                                | 90          |
| 4   | Labour shortage                                        | 4                              | 40          | 8                                | 80          |
| 5   | Strikes and labour disputes                            | 10                             | 100         | 0                                | 0           |
| 6   | Change orders/Variations                               | 0                              | 0           | 10                               | 100         |
| 7   | Unforeseen ground conditions                           | 6                              | 60          | 4                                | 40          |
| 8   | Inappropriate type of foundation                       | 7                              | 70          | 3                                | 30          |
| 9   | Errors in drawings                                     | 4                              | 40          | 2                                | 20          |
| 10  | Location and project restriction                       | 4                              | 40          | 6                                | 60          |
| 11  | Fluctuations (changes in cost)                         | 1                              | 10          | 9                                | 90          |
| 12  | Long waiting time for approval of drawings             | 5                              | 50          | 5                                | 50          |
| 13  | Unrealistic contract duration                          | 0                              | 0           | 10                               | 100         |
| 14  | Delay in Payment to contractor for work done           | 3                              | 30          | 7                                | 70          |
| 15  | Inadequate client experience                           | 1                              | 10          | 9                                | 90          |
| 16  | Delay in design information                            | 2                              | 20          | 8                                | 80          |
| 17  | Mistakes and discrepancies in design documents         | 4                              | 40          | 6                                | 60          |
| 18  | Inadequate design team experience                      | 3                              | 30          | 7                                | 70          |
| 19  | Long waiting time for approval of test samples         | 1                              | 10          | 9                                | 90          |
| 20  | Injury to persons                                      | 8                              | 80          | 2                                | 20          |
| 21  | Injury to property                                     | 9                              | 90          | 1                                | 10          |
| 22  | Damages and delays during construction                 | 6                              | 60          | 4                                | 40          |
| 23  | Contractor failure to enter into contract              | 7                              | 70          | 3                                | 30          |
| 24  | Shortage of materials in market                        | 4                              | 40          | 6                                | 60          |
| 25  | Inaccurate materials estimating                        | 1                              | 10          | 9                                | 90          |
| 26  | Poor site management and supervision                   | 0                              | 0           | 10                               | 100         |
| 27  | Inadequate contractor experience                       | 5                              | 50          | 5                                | 50          |
| 28  | Inadequate managerial skills                           | 2                              | 20          | 8                                | 80          |
| 29  | Defective work that must be removed and replaced       | 3                              | 30          | 3                                | 30          |
| 30  | Delays in subcontractors work                          | 1                              | 10          | 9                                | 90          |
| 31  | Shortage of liquidity                                  | 4                              | 40          | 6                                | 60          |
| 32  | Shortage of plant/equipment                            | 2                              | 20          | 8                                | 80          |
| 33  | Inaccurate prediction of equipment production output   | 4                              | 40          | 6                                | 60          |
| 34  | Weather                                                | 7                              | 70          | 1                                | 10          |
| 35  | Fire                                                   | 8                              | 80          | 2                                | 20          |
| 36  | Earth quake                                            | 7                              | 70          | 3                                | 30          |
| 37  | War                                                    | 2                              | 20          | 8                                | 80          |
| 38  | Nuclear weapons material                               | 1                              | 10          | 9                                | 90          |
| 39  | Radioactive materials                                  | 3                              | 30          | 7                                | 70          |
| 40  | Extraordinary wind                                     | 6                              | 60          | 4                                | 40          |
| 41  | Heavy rain                                             | 8                              | 80          | 2                                | 20          |
| 42  | Frequent changes in law                                | 2                              | 20          | 8                                | 80          |
| 43  | Exchange rate fluctuation                              | 4                              | 40          | 6                                | 60          |
| 44  | Financial problem due to errors in Estimation          | 2                              | 20          | 8                                | 80          |
| 45  | Insufficient insurance                                 | 5                              | 50          | 5                                | 50          |
| 46  | Theft                                                  | 7                              | 70          | 3                                | 30          |
| 47  | Materials damage during transportation                 | 9                              | 90          | 1                                | 10          |
| 48  | Interference by client                                 | 3                              | 30          | 7                                | 70          |
| 49  | Poor construction method                               | 0                              | 0           | 10                               | 100         |
| 50  | Low productivity of subcontractors                     | 2                              | 20          | 8                                | 80          |

## 2.2. Insurance Companies Ranking of Insurable and Uninsurable Risks

| NO. | RISK FACTORS IN CONSTRUCTION                           | INSURANCE COMPANIES            |             |                                  |             |
|-----|--------------------------------------------------------|--------------------------------|-------------|----------------------------------|-------------|
|     |                                                        | No. of Responses for insurable | % Responses | No. of Responses for uninsurable | % Responses |
| 1   | Permits delayed or take longer than expected           | 2                              | 15.38       | 11                               | 84.62       |
| 2   | Pressure to deliver project on an accelerated schedule | 1                              | 7.69        | 12                               | 92.31       |
| 3   | Low productivity                                       | 4                              | 30.77       | 9                                | 69.23       |
| 4   | Labour shortage                                        | 3                              | 23.08       | 10                               | 76.92       |
| 5   | Strikes and labour disputes                            | 7                              | 53.85       | 5                                | 38.46       |
| 6   | Change orders/Variations                               | 2                              | 15.38       | 11                               | 84.62       |
| 7   | Unforeseen ground conditions                           | 10                             | 76.92       | 3                                | 23.08       |
| 8   | Inappropriate type of foundation                       | 4                              | 30.77       | 9                                | 69.23       |
| 9   | Errors in drawings                                     | 8                              | 61.54       | 5                                | 38.46       |
| 10  | Location and project restriction                       | 6                              | 46.15       | 7                                | 53.85       |
| 11  | Fluctuations (changes in cost)                         | 1                              | 7.69        | 12                               | 92.31       |
| 12  | Long waiting time for approval of drawings             | 2                              | 15.38       | 11                               | 84.62       |
| 13  | Unrealistic contract duration                          | 1                              | 7.69        | 12                               | 92.31       |
| 14  | Delay in Payment to contractor for work done           | 8                              | 61.54       | 5                                | 38.46       |
| 15  | Inadequate client experience                           | 0                              | 0.00        | 13                               | 100.00      |
| 16  | Delay in design information                            | 2                              | 15.38       | 11                               | 84.62       |
| 17  | Mistakes and discrepancies in design documents         | 8                              | 61.54       | 5                                | 38.46       |
| 18  | Inadequate design team experience                      | 1                              | 7.69        | 12                               | 92.31       |
| 19  | Long waiting time for approval of test samples         | 2                              | 15.38       | 11                               | 84.62       |
| 20  | Injury to persons                                      | 13                             | 100.00      | 0                                | 0.00        |
| 21  | Injury to property                                     | 12                             | 92.31       | 1                                | 7.69        |
| 22  | Damages and delays during construction                 | 10                             | 76.92       | 3                                | 23.08       |
| 23  | Contractor failure to enter into contract              | 7                              | 53.85       | 6                                | 46.15       |
| 24  | Shortage of materials in market                        | 2                              | 15.38       | 11                               | 84.62       |
| 25  | Inaccurate materials estimating                        | 0                              | 0.00        | 13                               | 100.00      |
| 26  | Poor site management and supervision                   | 1                              | 7.69        | 12                               | 92.31       |
| 27  | Inadequate contractor experience                       | 8                              | 61.54       | 5                                | 38.46       |
| 28  | Inadequate managerial skills                           | 9                              | 69.23       | 4                                | 30.77       |
| 29  | Defective work that must be removed and replaced       | 7                              | 53.85       | 5                                | 38.46       |
| 30  | Delays in subcontractors work                          | 2                              | 15.38       | 11                               | 84.62       |
| 31  | Shortage of liquidity                                  | 5                              | 38.46       | 7                                | 53.85       |
| 32  | Shortage of plant/equipment                            | 4                              | 30.77       | 9                                | 69.23       |
| 33  | Inaccurate prediction of equipment production output   | 8                              | 61.54       | 5                                | 38.46       |
| 34  | Weather                                                | 10                             | 76.92       | 3                                | 23.08       |
| 35  | Fire                                                   | 9                              | 69.23       | 4                                | 30.77       |
| 36  | Earth quake                                            | 10                             | 76.92       | 3                                | 23.08       |
| 37  | War                                                    | 2                              | 15.38       | 11                               | 84.62       |
| 38  | Nuclear weapons material                               | 1                              | 7.69        | 12                               | 92.31       |
| 39  | Radioactive materials                                  | 5                              | 38.46       | 8                                | 61.54       |
| 40  | Extraordinary wind                                     | 9                              | 69.23       | 4                                | 30.77       |
| 41  | Heavy rain                                             | 12                             | 92.31       | 1                                | 7.69        |
| 42  | Frequent changes in law                                | 2                              | 15.38       | 11                               | 84.62       |
| 43  | Exchange rate fluctuation                              | 3                              | 23.08       | 10                               | 76.92       |
| 44  | Financial problem due to errors in Estimation          | 0                              | 0.00        | 13                               | 100.00      |
| 45  | Insufficient insurance                                 | 2                              | 15.38       | 11                               | 84.62       |
| 46  | Theft                                                  | 9                              | 69.23       | 4                                | 30.77       |
| 47  | Materials damage during transportation                 | 12                             | 92.31       | 1                                | 7.69        |
| 48  | Interference by client                                 | 5                              | 38.46       | 8                                | 61.54       |
| 49  | Poor construction method                               | 1                              | 7.69        | 12                               | 92.31       |
| 50  | Low productivity of subcontractors                     | 6                              | 46.15       | 7                                | 53.85       |

### 2.3. Consultants Ranking of Insurable and Uninsurable Risks

| NO. | RISK FACTORS IN CONSTRUCTION                           | CONSULTANTS                    |             |                                  |             |
|-----|--------------------------------------------------------|--------------------------------|-------------|----------------------------------|-------------|
|     |                                                        | No. of Responses for insurable | % Responses | No. of Responses for uninsurable | % Responses |
| 1   | Permits delayed or take longer than expected           | 2                              | 20.00       | 8                                | 80          |
| 2   | Pressure to deliver project on an accelerated schedule | 3                              | 30.00       | 7                                | 70          |
| 3   | Low productivity                                       | 1                              | 10.00       | 9                                | 90          |
| 4   | Labour shortage                                        | 4                              | 40.00       | 8                                | 80          |
| 5   | Strikes and labour disputes                            | 7                              | 70.00       | 3                                | 30          |
| 6   | Change orders/Variations                               | 0                              | 0.00        | 10                               | 100         |
| 7   | Unforeseen ground conditions                           | 6                              | 60.00       | 4                                | 40          |
| 8   | Inappropriate type of foundation                       | 2                              | 20.00       | 8                                | 80          |
| 9   | Errors in drawings                                     | 5                              | 50.00       | 5                                | 50          |
| 10  | Location and project restriction                       | 4                              | 40.00       | 6                                | 60          |
| 11  | Fluctuations (changes in cost)                         | 1                              | 10.00       | 9                                | 90          |
| 12  | Long waiting time for approval of drawings             | 5                              | 50.00       | 5                                | 50          |
| 13  | Unrealistic contract duration                          | 0                              | 0.00        | 10                               | 100         |
| 14  | Delay in Payment to contractor for work done           | 3                              | 30.00       | 7                                | 70          |
| 15  | Inadequate client experience                           | 1                              | 10.00       | 9                                | 90          |
| 16  | Delay in design information                            | 2                              | 20.00       | 8                                | 80          |
| 17  | Mistakes and discrepancies in design documents         | 4                              | 40.00       | 6                                | 60          |
| 18  | Inadequate design team experience                      | 3                              | 30.00       | 7                                | 70          |
| 19  | Long waiting time for approval of test samples         | 1                              | 10.00       | 9                                | 90          |
| 20  | Injury to persons                                      | 8                              | 80.00       | 2                                | 20          |
| 21  | Injury to property                                     | 9                              | 90.00       | 1                                | 10          |
| 22  | Damages and delays during construction                 | 6                              | 60.00       | 4                                | 40          |
| 23  | Contractor failure to enter into contract              | 7                              | 70.00       | 3                                | 30          |
| 24  | Shortage of materials in market                        | 4                              | 40.00       | 6                                | 60          |
| 25  | Inaccurate materials estimating                        | 1                              | 10.00       | 9                                | 90          |
| 26  | Poor site management and supervision                   | 0                              | 0.00        | 10                               | 100         |
| 27  | Inadequate contractor experience                       | 5                              | 50.00       | 5                                | 50          |
| 28  | Inadequate managerial skills                           | 2                              | 20.00       | 8                                | 80          |
| 29  | Defective work that must be removed and replaced       | 4                              | 40.00       | 6                                | 60          |
| 30  | Delays in subcontractors work                          | 1                              | 10.00       | 9                                | 90          |
| 31  | Shortage of liquidity                                  | 4                              | 40.00       | 6                                | 60          |
| 32  | Shortage of plant/equipment                            | 2                              | 20.00       | 8                                | 80          |
| 33  | Inaccurate prediction of equipment production output   | 4                              | 40.00       | 6                                | 60          |
| 34  | Weather                                                | 9                              | 90.00       | 1                                | 10          |
| 35  | Fire                                                   | 8                              | 80.00       | 2                                | 20          |
| 36  | Earth quake                                            | 6                              | 60.00       | 4                                | 40          |
| 37  | War                                                    | 2                              | 20.00       | 8                                | 80          |
| 38  | Nuclear weapons material                               | 1                              | 10.00       | 9                                | 90          |
| 39  | Radioactive materials                                  | 3                              | 30.00       | 7                                | 70          |
| 40  | Extraordinary wind                                     | 6                              | 60.00       | 4                                | 40          |
| 41  | Heavy rain                                             | 9                              | 90.00       | 1                                | 10          |
| 42  | Frequent changes in law                                | 2                              | 20.00       | 8                                | 80          |
| 43  | Exchange rate fluctuation                              | 4                              | 40.00       | 6                                | 60          |
| 44  | Financial problem due to errors in Estimation          | 2                              | 20.00       | 8                                | 80          |
| 45  | Insufficient insurance                                 | 5                              | 50.00       | 5                                | 50          |
| 46  | Theft                                                  | 7                              | 70.00       | 3                                | 30          |
| 47  | Materials damage during transportation                 | 9                              | 90.00       | 1                                | 10          |
| 48  | Interference by client                                 | 3                              | 30.00       | 7                                | 70          |
| 49  | Poor construction method                               | 0                              | 0.00        | 10                               | 100         |
| 50  | Low productivity of subcontractors                     | 2                              | 20.00       | 8                                | 80          |

## 2.4. Contractors Ranking of Insurable and Uninsurable Risks

| NO. | RISK FACTORS IN CONSTRUCTION                           | CONTRACTORS                    |             |                                  |             |
|-----|--------------------------------------------------------|--------------------------------|-------------|----------------------------------|-------------|
|     |                                                        | No. of Responses for insurable | % Responses | No. of Responses for uninsurable | % Responses |
| 1   | Permits delayed or take longer than expected           | 3                              | 25.00       | 9                                | 75.00       |
| 2   | Pressure to deliver project on an accelerated schedule | 1                              | 8.33        | 11                               | 91.67       |
| 3   | Low productivity                                       | 0                              | 0.00        | 12                               | 100.00      |
| 4   | Labour shortage                                        | 1                              | 8.33        | 11                               | 91.67       |
| 5   | Strikes and labour disputes                            | 10                             | 83.33       | 2                                | 16.67       |
| 6   | Change orders/Variations                               | 3                              | 25.00       | 9                                | 75.00       |
| 7   | Unforeseen ground conditions                           | 7                              | 58.33       | 5                                | 41.67       |
| 8   | Inappropriate type of foundation                       | 7                              | 58.33       | 5                                | 41.67       |
| 9   | Errors in drawings                                     | 2                              | 16.67       | 10                               | 83.33       |
| 10  | Location and project restriction                       | 0                              | 0.00        | 12                               | 100.00      |
| 11  | Fluctuations (changes in cost)                         | 4                              | 33.33       | 8                                | 66.67       |
| 12  | Long waiting time for approval of drawings             | 5                              | 41.67       | 7                                | 58.33       |
| 13  | Unrealistic contract duration                          | 1                              | 8.33        | 11                               | 91.67       |
| 14  | Delay in Payment to contractor for work done           | 3                              | 25.00       | 9                                | 75.00       |
| 15  | Inadequate client experience                           | 0                              | 0.00        | 12                               | 100.00      |
| 16  | Delay in design information                            | 3                              | 25.00       | 9                                | 75.00       |
| 17  | Mistakes and discrepancies in design documents         | 2                              | 16.67       | 10                               | 83.33       |
| 18  | Inadequate design team experience                      | 1                              | 8.33        | 11                               | 91.67       |
| 19  | Long waiting time for approval of test samples         | 2                              | 16.67       | 10                               | 83.33       |
| 20  | Injury to persons                                      | 11                             | 91.67       | 1                                | 8.33        |
| 21  | Injury to property                                     | 9                              | 75.00       | 3                                | 25.00       |
| 22  | Damages and delays during construction                 | 9                              | 75.00       | 3                                | 25.00       |
| 23  | Contractor failure to enter into contract              | 8                              | 66.67       | 4                                | 33.33       |
| 24  | Shortage of materials in market                        | 3                              | 25.00       | 9                                | 75.00       |
| 25  | Inaccurate materials estimating                        | 1                              | 8.33        | 11                               | 91.67       |
| 26  | Poor site management and supervision                   | 0                              | 0.00        | 12                               | 100.00      |
| 27  | Inadequate contractor experience                       | 7                              | 58.33       | 5                                | 41.67       |
| 28  | Inadequate managerial skills                           | 2                              | 16.67       | 10                               | 83.33       |
| 29  | Defective work that must be removed and replaced       | 6                              | 50.00       | 6                                | 50.00       |
| 30  | Delays in subcontractors work                          | 3                              | 25.00       | 9                                | 75.00       |
| 31  | Shortage of liquidity                                  | 0                              | 0.00        | 12                               | 100.00      |
| 32  | Shortage of plant/equipment                            | 2                              | 16.67       | 10                               | 83.33       |
| 33  | Inaccurate prediction of equipment production output   | 3                              | 25.00       | 9                                | 75.00       |
| 34  | Weather                                                | 8                              | 66.67       | 4                                | 33.33       |
| 35  | Fire                                                   | 12                             | 100.00      | 0                                | 0.00        |
| 36  | Earth quake                                            | 8                              | 66.67       | 4                                | 33.33       |
| 37  | War                                                    | 3                              | 25.00       | 9                                | 75.00       |
| 38  | Nuclear weapons material                               | 2                              | 16.67       | 10                               | 83.33       |
| 39  | Radioactive materials                                  | 1                              | 8.33        | 11                               | 91.67       |
| 40  | Extraordinary wind                                     | 7                              | 58.33       | 5                                | 41.67       |
| 41  | Heavy rain                                             | 9                              | 75.00       | 3                                | 25.00       |
| 42  | Frequent changes in law                                | 1                              | 8.33        | 11                               | 91.67       |
| 43  | Exchange rate fluctuation                              | 0                              | 0.00        | 12                               | 100.00      |
| 44  | Financial problem due to errors in Estimation          | 2                              | 16.67       | 10                               | 83.33       |
| 45  | Insufficient insurance                                 | 0                              | 0.00        | 12                               | 100.00      |
| 46  | Theft                                                  | 12                             | 100.00      | 0                                | 0.00        |
| 47  | Materials damage during transportation                 | 11                             | 91.67       | 1                                | 8.33        |
| 48  | Interference by client                                 | 2                              | 16.67       | 10                               | 83.33       |

|    |                                    |   |       |    |        |
|----|------------------------------------|---|-------|----|--------|
| 49 | Poor construction method           | 3 | 25.00 | 9  | 75.00  |
| 50 | Low productivity of subcontractors | 0 | 0.00  | 12 | 100.00 |

### Appendix-3: Ranking of Insurance Policies in the Road Construction Industry

#### 3.1 Client Ranking of Insurance Policies in the Road Construction Industry

| NO | INSURANCE POLICIES                                    | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|----|-------------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|    |                                                       | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1  | Contractor's all risk Insurance                       | 0     | 0 | 1 | 2 | 7 | 0.92                      | 1    |
| 2  | Performance bonds and Guarantees                      | 0     | 1 | 1 | 2 | 6 | 0.86                      | 3    |
| 3  | Professional Indemnity Insurance                      | 5     | 3 | 1 | 1 | 0 | 0.36                      | 14   |
| 4  | Workers compensation Insurance                        | 4     | 3 | 2 | 1 | 0 | 0.4                       | 13   |
| 5  | Comprehensive Commercial vehicles insurance           | 1     | 0 | 3 | 2 | 4 | 0.76                      | 5    |
| 6  | Public liability Insurance                            | 4     | 2 | 2 | 1 | 1 | 0.46                      | 8    |
| 7  | Employers' liability Insurance                        | 5     | 2 | 1 | 1 | 1 | 0.42                      | 10   |
| 8  | Fidelity guarantee                                    | 6     | 3 | 1 | 0 | 0 | 0.3                       | 18   |
| 9  | Third party insurance                                 | 2     | 4 | 3 | 3 | 0 | 0.62                      | 6    |
| 10 | Fire perils insurance on premises and contents        | 3     | 4 | 2 | 1 | 0 | 0.42                      | 10   |
| 11 | Bid bond                                              | 0     | 0 | 1 | 4 | 5 | 0.88                      | 2    |
| 12 | Goods in transit/Transport floater                    | 1     | 3 | 2 | 3 | 1 | 0.6                       | 7    |
| 13 | Earthquake Insurance                                  | 5     | 3 | 2 | 0 | 0 | 0.34                      | 16   |
| 14 | Contractor's Protective Public and Property Insurance | 6     | 2 | 1 | 1 | 1 | 0.44                      | 9    |
| 15 | Decennial or Inherent Defects Insurance               | 7     | 1 | 1 | 1 | 0 | 0.32                      | 17   |
| 16 | Group Life Insurance                                  | 4     | 3 | 2 | 0 | 1 | 0.42                      | 10   |
| 17 | Major Medical Insurance                               | 4     | 4 | 2 | 0 | 0 | 0.36                      | 14   |
| 18 | Plant and Equipment Insurance                         | 0     | 1 | 2 | 3 | 4 | 0.8                       | 4    |

#### 3.2 Consultants Ranking of Insurance Policies in the Road Construction Industry

| NO | INSURANCE POLICIES                                    | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|----|-------------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|    |                                                       | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1  | Contractor's all risk Insurance                       | 0     | 1 | 2 | 3 | 4 | 0.80                      | 3    |
| 2  | Performance bonds and Guarantees                      | 0     | 1 | 2 | 2 | 5 | 0.82                      | 2    |
| 3  | Professional Indemnity Insurance                      | 2     | 3 | 2 | 2 | 1 | 0.54                      | 8    |
| 4  | Workers compensation Insurance                        | 3     | 2 | 2 | 3 | 0 | 0.50                      | 9    |
| 5  | Comprehensive Commercial vehicles insurance           | 1     | 2 | 3 | 4 | 0 | 0.60                      | 6    |
| 6  | Public liability Insurance                            | 3     | 2 | 3 | 2 | 0 | 0.48                      | 10   |
| 7  | Employers' liability Insurance                        | 4     | 3 | 2 | 1 | 0 | 0.40                      | 12   |
| 8  | Fidelity guarantee                                    | 6     | 3 | 1 | 0 | 0 | 0.30                      | 18   |
| 9  | Third party insurance                                 | 2     | 4 | 3 | 1 | 0 | 0.46                      | 11   |
| 10 | Fire perils insurance on premises and contents        | 1     | 1 | 2 | 4 | 2 | 0.70                      | 5    |
| 11 | Bid bond                                              | 0     | 1 | 1 | 3 | 5 | 0.84                      | 1    |
| 12 | Goods in transit/Transport floater                    | 2     | 1 | 4 | 2 | 1 | 0.58                      | 7    |
| 13 | Earthquake Insurance                                  | 5     | 2 | 2 | 1 | 0 | 0.38                      | 13   |
| 14 | Contractor's Protective Public and Property Insurance | 4     | 3 | 3 | 0 | 0 | 0.38                      | 13   |
| 15 | Decennial or Inherent Defects Insurance               | 4     | 4 | 2 | 0 | 0 | 0.36                      | 15   |
| 16 | Group Life Insurance                                  | 6     | 2 | 2 | 0 | 0 | 0.32                      | 17   |
| 17 | Major Medical Insurance                               | 4     | 4 | 2 | 0 | 0 | 0.36                      | 15   |
| 18 | Plant and Equipment Insurance                         | 0     | 2 | 2 | 4 | 2 | 0.72                      | 4    |

### 3.3: Insurance Companies Ranking of Insurance Policies in the Road Construction Industry

| NO | INSURANCE POLICIES                                    | SCORE |   |   |   |    | RELATIVE IMPORTANCE INDEX | RANK |
|----|-------------------------------------------------------|-------|---|---|---|----|---------------------------|------|
|    |                                                       | 1     | 2 | 3 | 4 | 5  |                           |      |
| 1  | Contractors all risk Insurance                        | 1     | 0 | 3 | 3 | 6  | 0.80                      | 5    |
| 2  | Performance bonds and Guarantees                      | 0     | 1 | 2 | 4 | 6  | 0.83                      | 4    |
| 3  | Professional Indemnity Insurance                      | 3     | 2 | 5 | 2 | 1  | 0.54                      | 12   |
| 4  | Workers compensation Insurance                        | 1     | 2 | 3 | 2 | 5  | 0.72                      | 7    |
| 5  | Comprehensive Commercial vehicles insurance           | 1     | 0 | 1 | 1 | 11 | 0.97                      | 1    |
| 6  | Public liability Insurance                            | 4     | 3 | 5 | 1 | 0  | 0.45                      | 14   |
| 7  | Employers' liability Insurance                        | 2     | 2 | 4 | 1 | 4  | 0.65                      | 10   |
| 8  | Fidelity guarantee                                    | 4     | 3 | 4 | 2 | 0  | 0.46                      | 13   |
| 9  | Third party insurance                                 | 1     | 1 | 3 | 5 | 3  | 0.72                      | 7    |
| 10 | Fire perils insurance on premises and contents        | 2     | 4 | 1 | 2 | 4  | 0.63                      | 11   |
| 11 | Bid bond                                              | 0     | 0 | 1 | 3 | 9  | 0.92                      | 2    |
| 12 | Goods in transit/Transport floater                    | 0     | 1 | 5 | 3 | 4  | 0.75                      | 6    |
| 13 | Earthquake Insurance                                  | 4     | 3 | 5 | 1 | 0  | 0.45                      | 14   |
| 14 | Contractor's Protective Public and Property Insurance | 4     | 5 | 2 | 1 | 0  | 0.37                      | 16   |
| 15 | Decennial or Inherent Defects Insurance               | 12    | 1 | 0 | 0 | 0  | 0.22                      | 18   |
| 16 | Group Life Insurance                                  | 8     | 1 | 3 | 1 | 0  | 0.35                      | 17   |
| 17 | Major Medical Insurance                               | 3     | 1 | 2 | 3 | 4  | 0.66                      | 9    |
| 18 | Plant and Equipment Insurance                         | 0     | 0 | 1 | 4 | 8  | 0.91                      | 3    |

### 3.4: Contractors Ranking of Insurance Policies in the Road Construction Industry

| NO | INSURANCE POLICIES                                    | SCORE |   |   |   |   | RELATIVE IMPORTANCE INDEX | RANK |
|----|-------------------------------------------------------|-------|---|---|---|---|---------------------------|------|
|    |                                                       | 1     | 2 | 3 | 4 | 5 |                           |      |
| 1  | Contractors all risks Insurance                       | 0     | 1 | 1 | 3 | 7 | 0.87                      | 3    |
| 2  | Performance bonds and Guarantees                      | 0     | 0 | 1 | 3 | 8 | 0.92                      | 2    |
| 3  | Professional Indemnity Insurance                      | 3     | 6 | 1 | 2 | 0 | 0.43                      | 14   |
| 4  | Workers compensation Insurance                        | 1     | 2 | 2 | 3 | 4 | 0.72                      | 8    |
| 5  | Comprehensive Commercial vehicles insurance           | 1     | 0 | 3 | 2 | 6 | 0.80                      | 5    |
| 6  | Public liability Insurance                            | 5     | 4 | 2 | 1 | 0 | 0.38                      | 16   |
| 7  | Employers' liability Insurance                        | 3     | 3 | 4 | 1 | 1 | 0.50                      | 11   |
| 8  | Fidelity guarantee                                    | 6     | 3 | 2 | 1 | 0 | 0.37                      | 17   |
| 9  | Third party insurance                                 | 0     | 2 | 3 | 4 | 3 | 0.73                      | 7    |
| 10 | Fire perils insurance on premises and contents        | 1     | 4 | 2 | 2 | 3 | 0.63                      | 9    |
| 11 | Bid bond                                              | 0     | 0 | 0 | 4 | 8 | 0.93                      | 1    |
| 12 | Goods in transit/Transport floater                    | 1     | 1 | 2 | 2 | 6 | 0.78                      | 6    |
| 13 | Earthquake Insurance                                  | 3     | 6 | 0 | 3 | 0 | 0.45                      | 13   |
| 14 | Contractor's Protective Public and Property Insurance | 3     | 4 | 3 | 1 | 1 | 0.48                      | 12   |
| 15 | Decennial or Inherent Defects Insurance               | 8     | 3 | 1 | 0 | 0 | 0.28                      | 18   |
| 16 | Group Life Insurance                                  | 5     | 4 | 1 | 1 | 1 | 0.42                      | 15   |
| 17 | Major Medical Insurance                               | 1     | 4 | 2 | 3 | 2 | 0.62                      | 10   |
| 18 | Plant and Equipment Insurance                         | 0     | 1 | 1 | 4 | 6 | 0.85                      | 4    |

### 3.5: Weighted Average and Ranking for Respondents of Insurance Policies in the Road Construction Industry

| NO | INSURANCE POLICIES                             | CLIENT RII | CONSULTANTS RII | INSURANCE COMPANY RII | CONTRACTORS RII | WEIGHTED AVERAGE | RANK |
|----|------------------------------------------------|------------|-----------------|-----------------------|-----------------|------------------|------|
| 1  | Contractors all risk                           | 0.92       | 0.8             | 0.80                  | 0.87            | 0.85             | 3    |
| 2  | Performance bond                               | 0.86       | 0.82            | 0.88                  | 0.92            | 0.87             | 2    |
| 3  | Professional Indemnity                         | 0.36       | 0.54            | 0.54                  | 0.43            | 0.47             | 11   |
| 4  | Workers compensation                           | 0.4        | 0.54            | 0.72                  | 0.72            | 0.59             | 9    |
| 5  | Motor insurance to cover vehicles              | 0.76       | 0.6             | 0.97                  | 0.80            | 0.78             | 5    |
| 6  | Public liability                               | 0.46       | 0.48            | 0.45                  | 0.38            | 0.44             | 12   |
| 7  | Employers' liability                           | 0.42       | 0.4             | 0.65                  | 0.50            | 0.49             | 10   |
| 8  | Fidelity guarantee                             | 0.3        | 0.3             | 0.46                  | 0.37            | 0.36             | 17   |
| 9  | Third party insurance                          | 0.62       | 0.48            | 0.75                  | 0.80            | 0.66             | 7    |
| 10 | Fire perils insurance on premises and contents | 0.42       | 0.7             | 0.65                  | 0.63            | 0.60             | 8    |
| 11 | Bid bond                                       | 0.88       | 0.84            | 0.92                  | 0.93            | 0.89             | 1    |
| 12 | Goods in transit/Transport floater             | 0.6        | 0.58            | 0.80                  | 0.78            | 0.69             | 6    |
| 13 | Earthquake Insurance                           | 0.34       | 0.38            | 0.45                  | 0.45            | 0.40             | 15   |
| 14 | Contractors' Protective Public and Property    | 0.44       | 0.38            | 0.35                  | 0.48            | 0.41             | 14   |
| 15 | Liability Insurance                            | 0.32       | 0.36            | 0.22                  | 0.28            | 0.29             | 18   |
| 16 | Group Life Insurance                           | 0.42       | 0.32            | 0.35                  | 0.42            | 0.38             | 16   |
| 17 | Major Medical Insurance                        | 0.36       | 0.36            | 0.42                  | 0.62            | 0.44             | 13   |
| 18 | Plant and Equipment Insurance                  | 0.8        | 0.72            | 0.91                  | 0.85            | 0.82             | 4    |

#### Appendix-4: Kendall Concordance Test

| Insurable |                                                        |             |                 |             |             |                           |      |                        |
|-----------|--------------------------------------------------------|-------------|-----------------|-------------|-------------|---------------------------|------|------------------------|
| NO        | Risk Factors in Construction                           | % Responses |                 |             |             | O.All % Responses Average | Rank | (R-Rmean) <sup>2</sup> |
|           |                                                        | Client      | Insurance Comp. | Consultants | Contractors |                           |      |                        |
| 1         | Permits delayed or take longer than expected           | 30          | 15.38           | 20          | 25          | 22.60                     | 33   | 56.55                  |
| 2         | Pressure to deliver project on an accelerated schedule | 10          | 7.69            | 30          | 8.33        | 14.01                     | 41   | 240.87                 |
| 3         | Low productivity                                       | 20          | 30.77           | 10          | 0.00        | 15.19                     | 40   | 210.83                 |
| 4         | Labour shortage                                        | 40          | 23.08           | 20          | 8.33        | 22.85                     | 31   | 30.47                  |
| 5         | Strikes and labour disputes                            | 80          | 92.31           | 100         | 83.33       | 88.91                     | 3    | 505.35                 |
| 6         | Change orders/Variations                               | 10          | 15.38           | 0           | 25.00       | 12.60                     | 43   | 306.95                 |
| 7         | Unforeseen ground conditions                           | 70          | 76.92           | 60          | 66.67       | 68.40                     | 13   | 155.75                 |
| 8         | Inappropriate type of foundation                       | 60          | 30.77           | 70          | 58.33       | 54.78                     | 18   | 55.95                  |
| 9         | Errors in drawings                                     | 70          | 61.54           | 80          | 16.67       | 57.05                     | 17   | 71.91                  |
| 10        | Location and project restriction                       | 10          | 46.15           | 40          | 0.00        | 24.04                     | 29   | 12.39                  |
| 11        | Fluctuations (changes in cost)                         | 40          | 7.69            | 10          | 33.33       | 22.76                     | 32   | 42.51                  |
| 12        | Long waiting time for approval of drawings             | 30          | 15.38           | 80          | 41.67       | 41.76                     | 20   | 30.03                  |
| 13        | Unrealistic contract duration                          | 0           | 7.69            | 0           | 8.33        | 4.01                      | 49   | 553.19                 |
| 14        | Delay in Payment to contractor for work done           | 40          | 61.54           | 30          | 25.00       | 39.13                     | 22   | 12.11                  |
| 15        | Inadequate client experience                           | 10          | 0.00            | 10          | 0.00        | 5.00                      | 48   | 507.15                 |
| 16        | Delay in design information                            | 20          | 15.38           | 20          | 25.00       | 20.10                     | 35   | 90.63                  |
| 17        | Mistakes and discrepancies in design documents         | 30          | 61.54           | 40          | 16.67       | 37.05                     | 23   | 6.15                   |
| 18        | Inadequate design team experience                      | 40          | 7.69            | 30          | 8.33        | 21.51                     | 34   | 72.59                  |
| 19        | Long waiting time for approval of test samples         | 0           | 15.38           | 10          | 16.67       | 10.51                     | 47   | 463.11                 |
| 20        | Injury to persons                                      | 80          | 100.00          | 80          | 91.67       | 87.92                     | 5    | 419.43                 |

**CONSTRUCTION RISKS MANAGEMENT THROUGH INSURANCE IN THE ETHIOPIAN FEDERAL ROAD PROJECTS**

|             |                                                      |     |        |     |        |       |    |                                         |
|-------------|------------------------------------------------------|-----|--------|-----|--------|-------|----|-----------------------------------------|
| 21          | Injury to property                                   | 100 | 100.00 | 90  | 100.00 | 97.50 | 1  | 599.27                                  |
| 22          | Damages and delays during construction               | 70  | 100.00 | 60  | 75.00  | 76.25 | 11 | 209.67                                  |
| 23          | Contractor failure to enter into contract            | 60  | 53.85  | 70  | 66.67  | 62.63 | 15 | 109.83                                  |
| 24          | Shortage of materials in market                      | 20  | 15.38  | 40  | 25.00  | 25.10 | 28 | 6.35                                    |
| 25          | Inaccurate materials estimating                      | 30  | 0.00   | 10  | 8.33   | 12.08 | 45 | 381.03                                  |
| 26          | Poor site management and supervision                 | 0   | 7.69   | 0   | 0.00   | 1.92  | 50 | 601.23                                  |
| 27          | Inadequate contractor experience                     | 70  | 61.54  | 50  | 58.33  | 59.97 | 16 | 89.87                                   |
| 28          | Inadequate managerial skills                         | 60  | 69.23  | 20  | 16.67  | 41.47 | 21 | 20.07                                   |
| 29          | Defective work that must be removed and replaced     | 70  | 53.85  | 70  | 66.67  | 65.13 | 14 | 131.79                                  |
| 30          | Delays in subcontractors work                        | 0   | 15.38  | 10  | 25.00  | 12.60 | 43 | 306.95                                  |
| 31          | Shortage of liquidity                                | 40  | 38.46  | 40  | 0.00   | 29.62 | 25 | 0.23                                    |
| 32          | Shortage of plant/equipment                          | 10  | 30.77  | 20  | 16.67  | 19.36 | 36 | 110.67                                  |
| 33          | Inaccurate prediction of equipment production output | 20  | 61.54  | 40  | 75.00  | 49.13 | 19 | 41.99                                   |
| 34          | Weather                                              | 60  | 76.92  | 90  | 91.67  | 79.65 | 9  | 271.59                                  |
| 35          | Fire                                                 | 80  | 69.23  | 80  | 100.00 | 82.31 | 8  | 305.55                                  |
| 36          | Earth quake                                          | 70  | 76.92  | 100 | 66.67  | 78.40 | 10 | 239.63                                  |
| 37          | War                                                  | 280 | 15.38  | 20  | 25.00  | 85.10 | 7  | 341.51                                  |
| 38          | Nuclear weapons material                             | 20  | 7.69   | 10  | 16.67  | 13.59 | 42 | 272.91                                  |
| 39          | Radioactive materials                                | 0   | 38.46  | 30  | 8.33   | 19.20 | 37 | 132.71                                  |
| 40          | Extraordinary wind                                   | 100 | 69.23  | 60  | 58.33  | 71.89 | 12 | 181.71                                  |
| 41          | Heavy rain                                           | 90  | 92.31  | 90  | 75.00  | 86.83 | 6  | 379.47                                  |
| 42          | Frequent changes in law                              | 20  | 15.38  | 20  | 8.33   | 15.93 | 39 | 182.79                                  |
| 43          | Exchange rate fluctuation                            | 30  | 23.08  | 40  | 0.00   | 23.27 | 30 | 20.43                                   |
| 44          | Financial problem due to errors in Estimation        | 40  | 0.00   | 20  | 16.67  | 19.17 | 38 | 156.75                                  |
| 45          | Insufficient insurance                               | 60  | 15.38  | 50  | 0.00   | 31.35 | 24 | 2.19                                    |
| 46          | Theft                                                | 90  | 69.23  | 100 | 100.00 | 89.81 | 2  | 551.31                                  |
| 47          | Materials damage during transportation               | 80  | 92.31  | 90  | 91.67  | 88.49 | 4  | 461.39                                  |
| 48          | Interference by client                               | 30  | 38.46  | 30  | 16.67  | 28.78 | 27 | 2.31                                    |
| 49          | Poor construction method                             | 10  | 7.69   | 0   | 25.00  | 10.67 | 46 | 421.07                                  |
| 50          | Low productivity of subcontractors                   | 50  | 46.15  | 20  | 0.00   | 29.04 | 26 | 0.27                                    |
| Sum=12*S    |                                                      |     |        |     |        |       |    | 105,048.00                              |
| Mean= 25.48 |                                                      |     |        |     |        |       |    | 12xmx(m <sup>2</sup> -1)=<br>124,950.00 |
|             |                                                      |     |        |     |        |       |    | <b>W= 0.84</b>                          |

## Appendix-5: Sample Questionnaires

### 1) Questionnaire for Employer (ERA)

#### Section - I: Company and Respondent Profile

(Please indicate with “√” when appropriate)

1.1. Company Name (optional):-----

1.2. Type or origin of your organization

Project Owner/Client [    ]

Others (please specify) -----

Year of establishment: < 5 years [    ]    6-10 years [    ]    10-15 years [    ] >15years [    ]

Others (please specify) -----

1.3. In your company/agency, which position in the organizational level you are?

Top management [    ]    Middle management [    ]    Expert [    ]    others [    ]

1.4. Please indicate your area of specialization as far as practicing in the road construction industry is concerned

Project Management [    ]    Structural Engineering [    ]    Geotechnical Engineering [    ]

Highway Engineering [    ]    any other (state).....

1.5. How long have you been involved in the road sector projects?

Less than 5 years [    ]    6-10 years [    ]    More than 10 years [    ]

1.6. How many road projects have you been involved in?

Less than 5 projects [    ]    6-10 projects [    ]    More than 10 projects [    ]

#### Section-II: Basic Information on Road Construction Risk Management

2.1. Please indicate your level of understanding of the concept of risk management practices

Understand deeply through reading and practice. [    ]

Only read about it [    ]

Not read about it but understand from practice [    ]

No knowledge about it [    ]

**2.2.** Do you have a formal risk analysis practice in your organization of road construction/design projects' management?

Yes [    ]                      No [    ]

**2.3.** If your answer to the above question is yes, who performs in your organization the risk analysis? (Please check ALL that apply.)

Risk manager within your organization [    ]

Design/Supervision Consultant [    ]

Independent risk consultant [    ]

Insurance broker(s) [    ]

Departmental personnel [    ]

Other (please specify below):

-----

**2.4.** At what stage of project life-cycle do you perform the risk analysis? (Please check ALL that apply.)

At the planning phase [    ]

At the end of conceptual design [    ]

At the end of preliminary Engineering design [    ]

At the end of final design [    ]

At the time of tendering [    ]

During construction phase [    ]

After completion of the construction [    ]

Other (please specify below)

-----

**2.5.** Which of the following methods do you often use to identify risks associated with a project? Rank them on the scale of 1 – 5 (from 1 = least to 5= most use).

| NO | METHODS                              | RANK |   |   |   |   |
|----|--------------------------------------|------|---|---|---|---|
|    |                                      | 1    | 2 | 3 | 4 | 5 |
| 1  | Brainstorming amongst a project team |      |   |   |   |   |

|   |                                                |  |  |  |  |  |
|---|------------------------------------------------|--|--|--|--|--|
| 2 | By past experience /Analysis of prior projects |  |  |  |  |  |
| 3 | Judgment of the estimator/Quantity surveyor    |  |  |  |  |  |
| 4 | By the risk management department in the firm  |  |  |  |  |  |
| 5 | By the opinion of external consultant          |  |  |  |  |  |
| 6 | Checklists                                     |  |  |  |  |  |
| 7 | Visits to site                                 |  |  |  |  |  |
| 8 | Tender review by management                    |  |  |  |  |  |

Any other (state).....

**2.6.** If you conduct a formal risk assessment, what does the process consist of? (Please check ALL that apply.)

Just adding a percentage to budget/cost to cope with uncertainties [    ]

Identify major risk factors and quantify their impact subjectively [    ]

Use of various mathematical tools: such as sensitivity analysis, net present value etc. [    ]

Identify risk factors and quantify their impact using probability of occurrence, range of risk costs and simulation [    ]

Other (please specify below):

-----

**2.7.** Risk allocation is the apportionments of risks to those project/contracting parties who can best manage them and its objective can vary depending on unique project goals, but four fundamental tenets of sound risk allocation should always be followed:

- ✓ Allocate risks to the party best able manage them.
- ✓ Allocate the risk in alignment with project goals.
- ✓ Share risk when appropriate to accomplish project goals.
- ✓ Ultimately seek to allocate risks to promote team alignment with customer-oriented performance goals.

Based on your experience in the construction of road projects in Ethiopia do you agree that those principles are adhered in the allocation of risks to parties in contract?

Strongly Agree, [    ]

Agree, [    ]

Neutral [    ]

Disagree [    ]

Strongly Disagree [    ]

Other opinion

### Section - III: Construction Insurance Practices

**3.1.** Do you consider construction insurance provisions in your contract conditions in the selection of Contractors/Subcontractors or Consultants?

Yes [    ]                      No [    ]

**3.2.** Do you purchase insurance policies as part of your construction risks management in your road projects?

Yes [    ]                      No [    ]

**3.3.** Please specify the percentage of price in your cost analysis for insurance coverage

-----

**3.4.** Who assists with the insurance purchasing decision? (Please check ALL that apply.)

Internal staff [    ]

Design/Supervision Consultant [    ]

Outside risk management consultant [    ]

Insurance broker [    ]

Committee [    ]

Other (please specify below):

-----

**3.5.** Which of the following factors do you consider in determining whether a risk is insurable or not? Rank them on the scale of 1 – 5 (from 1=least to 5=most used).

| NO | FACTORS                                   | RANK |   |   |   |   |
|----|-------------------------------------------|------|---|---|---|---|
|    |                                           | 1    | 2 | 3 | 4 | 5 |
| 1  | Past history of the risk                  |      |   |   |   |   |
| 2  | Easy to assess the extent of the damage   |      |   |   |   |   |
| 3  | Easy to determine the cause of the damage |      |   |   |   |   |
| 4  | Risks with high premiums                  |      |   |   |   |   |
| 5  | Difficult in assessing the risk premiums  |      |   |   |   |   |
| 6  | Unquantifiable risks                      |      |   |   |   |   |
| 7  | Foreseeable risks                         |      |   |   |   |   |
| 8  | Unforeseeable risks                       |      |   |   |   |   |

Any other (state).....

**3.6.** The following is a list of risk factors in construction. Please indicate by ticking which risks are insurable and those uninsurable in projects undertaken by you.

Then rank them on a scale of 1 to 5 points based on their effect on the project.

- ✓ Critical risk – five points – would cause program failure.
- ✓ Serious risk – four points – would cause major cost or schedule increases and secondary requirements may not be achieved.
- ✓ Moderate risk – three points – would cause moderate cost/schedule increases; important requirements would still be met.
- ✓ Minor risk – two points – would cause only small cost/schedule increases.
- ✓ Negligible risk – one point – would have no substantive effect on cost or schedule

| No | RISK FACTORS IN CONSTRUCTION                           | TICK      |             | RANK |   |   |   |   |
|----|--------------------------------------------------------|-----------|-------------|------|---|---|---|---|
|    |                                                        | INSURABLE | UNINSURABLE | 1    | 2 | 3 | 4 | 5 |
| 1  | Permits delayed or take longer than expected           |           |             |      |   |   |   |   |
| 2  | Pressure to deliver project on an accelerated schedule |           |             |      |   |   |   |   |
| 3  | Labour shortage                                        |           |             |      |   |   |   |   |
| 4  | Strikes and labour disputes                            |           |             |      |   |   |   |   |
| 5  | Low productivity                                       |           |             |      |   |   |   |   |
| 6  | Change orders/Variations                               |           |             |      |   |   |   |   |
| 7  | Unforeseen ground conditions                           |           |             |      |   |   |   |   |
| 8  | Inappropriate type of foundation                       |           |             |      |   |   |   |   |
| 9  | Errors in drawings                                     |           |             |      |   |   |   |   |
| 10 | Location and project restriction                       |           |             |      |   |   |   |   |
| 11 | Fluctuations (changes in cost)                         |           |             |      |   |   |   |   |
| 12 | Long waiting time for approval of drawings             |           |             |      |   |   |   |   |
| 13 | Unrealistic contract duration                          |           |             |      |   |   |   |   |
| 14 | Delay in Payment to contractor for work done           |           |             |      |   |   |   |   |
| 15 | Inadequate client experience                           |           |             |      |   |   |   |   |
| 16 | Delay in design information                            |           |             |      |   |   |   |   |
| 17 | Mistakes and discrepancies in design documents         |           |             |      |   |   |   |   |
| 18 | Inadequate design team experience                      |           |             |      |   |   |   |   |
| 19 | Long waiting time for approval of test samples         |           |             |      |   |   |   |   |
| 20 | Injury to persons                                      |           |             |      |   |   |   |   |
| 21 | Injury to property                                     |           |             |      |   |   |   |   |
| 22 | Damages and delays during construction                 |           |             |      |   |   |   |   |
| 23 | Contractor failure to enter into contract              |           |             |      |   |   |   |   |
| 24 | Shortage of materials in market                        |           |             |      |   |   |   |   |
| 25 | Inaccurate materials estimating                        |           |             |      |   |   |   |   |
| 26 | Poor site management and supervision                   |           |             |      |   |   |   |   |
| 27 | Inadequate contractor experience                       |           |             |      |   |   |   |   |
| 28 | Inadequate managerial skills                           |           |             |      |   |   |   |   |
| 29 | Defective work that must be removed and replaced       |           |             |      |   |   |   |   |
| 30 | Delays in subcontractors work                          |           |             |      |   |   |   |   |
| 31 | Shortage of liquidity                                  |           |             |      |   |   |   |   |
| 32 | Shortage of plant/equipment                            |           |             |      |   |   |   |   |
| 33 | Inaccurate prediction of equipment production output   |           |             |      |   |   |   |   |

|    |                                               |  |  |  |  |  |  |  |
|----|-----------------------------------------------|--|--|--|--|--|--|--|
| 34 | Weather                                       |  |  |  |  |  |  |  |
| 35 | Fire                                          |  |  |  |  |  |  |  |
| 36 | Earth quake                                   |  |  |  |  |  |  |  |
| 37 | War                                           |  |  |  |  |  |  |  |
| 38 | Nuclear weapons material                      |  |  |  |  |  |  |  |
| 39 | Radioactive materials                         |  |  |  |  |  |  |  |
| 40 | Extraordinary wind                            |  |  |  |  |  |  |  |
| 41 | Heavy rain                                    |  |  |  |  |  |  |  |
| 42 | Frequent changes in law                       |  |  |  |  |  |  |  |
| 43 | Exchange rate fluctuation                     |  |  |  |  |  |  |  |
| 44 | Financial problem due to errors in Estimation |  |  |  |  |  |  |  |
| 45 | Insufficient insurance                        |  |  |  |  |  |  |  |
| 46 | Theft                                         |  |  |  |  |  |  |  |
| 47 | Materials damage during transportation        |  |  |  |  |  |  |  |
| 48 | Interference by client                        |  |  |  |  |  |  |  |
| 49 | Poor construction method                      |  |  |  |  |  |  |  |
| 50 | Low productivity of subcontractors            |  |  |  |  |  |  |  |

**3.7.** The following are insurance policies typically involved in construction projects.  
Rank them, based on the most purchased, on a scale of 1 to 5 (from 1=least to 5= most use).

| NO | INSURANCE POLICIES                                    | RANK |   |   |   |   |
|----|-------------------------------------------------------|------|---|---|---|---|
|    |                                                       | 1    | 2 | 3 | 4 | 5 |
| 1  | Contractor's All Risks Policy(CAR)                    |      |   |   |   |   |
| 2  | Performance bonds and guarantees                      |      |   |   |   |   |
| 3  | Professional Indemnity Insurance                      |      |   |   |   |   |
| 4  | Workers compensation Insurance                        |      |   |   |   |   |
| 5  | Comprehensive Commercial vehicles Insurance           |      |   |   |   |   |
| 6  | Public liability Insurance                            |      |   |   |   |   |
| 7  | Employers' liability Insurance                        |      |   |   |   |   |
| 8  | Fidelity guarantee                                    |      |   |   |   |   |
| 9  | Third party liability insurance                       |      |   |   |   |   |
| 10 | Fire perils insurance on premises and contents        |      |   |   |   |   |
| 11 | Bid bond                                              |      |   |   |   |   |
| 12 | Goods in transit and Marine Insurance                 |      |   |   |   |   |
| 13 | Earthquake Insurance                                  |      |   |   |   |   |
| 14 | Contractor's Protective Public and Property Insurance |      |   |   |   |   |
| 15 | Decennial or Inherent Defect Policy insurance         |      |   |   |   |   |
| 16 | Group Life Insurance                                  |      |   |   |   |   |
| 17 | Major Medical Insurance                               |      |   |   |   |   |
| 18 | Plant and Equipment Insurance                         |      |   |   |   |   |

Other (Please specify below):

-----

**3.8.** Why do you provide the above insurance cover? Tick all those applicable

To meet the demand of the client [    ]

To transfer risk ☐

To reduce the impact of any disaster during construction ☐

To meet tender and contract requirement ☐

Recommendation of insurance advisor ☐

Other (please specify below):

-----

**3.9.** Which of the following insurance groups do you deal with when insuring your project?

Insurance company ☐, Insurance agent ☐, Insurance broker ☐

Any other (state).....

**3.10.** Which of the following problems or concerns are faced with respect to insurance provisions in the Ethiopian road construction industry?

Tick all those applicable

Rising cost of premiums ☐

Fewer companies willing to insure ☐,

Complex policy language ☐,

Lack of proper coverage or exclusion ☐,

High collateral demands by insurance companies ☐,

Lack of knowledge in insurance ☐

Impact of reinsurer cost on the premium ☐

**3.11.** Do you normally interact with insurance companies in risk identification, allocation and insurance policies before or during construction?

Yes ☐

No ☐

**3.12.** Do the insurance companies visit the project site during construction?

Yes ☐

No ☐

**3.13.** Have you ever encountered any severe accident/damage during construction of road projects you were involved?

Yes ☐

No ☐

If your answer is yes, please describe the extent of the damage occurred and how the damage remedied (if possible in monetary terms)

-----  
-----  
-----

**3.14.** Do you have any damage occurred in your road projects and compensated/denied by insurance claims?

Yes [    ]

No [    ]

If your answer is yes, please indicate the amount of compensation you received in a monetary terms

---

---

---

**3.15.** What is your opinion on the role of insurance in the development of the road sector in Ethiopia?

Very important [    ]

Important [    ]

Average [    ]

Low [    ]

None [    ]

**3.16.** What are your overall suggestions on Construction Risks Management through Insurance practices in the Ethiopian road construction projects?

---

---

---

**3.17.** Any other comments you wish to provide:

---

---

---

---

*I sincerely appreciate your timely response and cooperation.*

***Thank You!!***

## 2. Questionnaire for Consultants

### Section - I: Company and Respondent Profile

(Please indicate with “√” when appropriate)

**2.1.** Company Name (optional):-----

**1.2.** Type or origin of your organization

Domestic Consultant [    ]      Foreign Consultant [    ]

Others (please specify) -----

Year of establishment: < 5 years [    ]    6-10 years [    ]    10-15 years [    ] >15years [    ]

Please indicate classification/category of your company belong to (If applicable);

Grade/Category- 1 [    ]    Grade/Category- 2 [    ]    Grade/Category- 3 [    ]

Others (please specify) -----

**1.3.** If Foreign Consultant, how long has your organization been involved in the Ethiopian road construction sector?

Less than 5 years [    ]    6-10 years [    ]    More than 10 years [    ]

**1.4.** In your company, which position in the organizational level you are?

Top management [    ]    Middle management [    ]    Expert [    ]    others [    ]

**1.5.** Please indicate your area of specialization as far as practicing in the road construction industry is concerned

Project Management [    ]    Structural Engineering [    ]    Quantity surveying [    ]    Safety [    ]  
[    ] any other (state).....

**1.6.** How long have you been involved in the road sector projects?

Less than 5 years [    ]    6-10 years [    ]    More than 10 years [    ]

**1.7.** How many road projects have you been involved in?

Less than 5 projects [    ]    6-10 projects [    ]    More than 10 projects [    ]

1.8. What is your present capital? -----

1.9. How many employees do you have? -----

## Section-II: Basic Information on Road Construction Risk Management

2.1. Please indicate your level of understanding of the concept of risk management practices

Understand deeply through reading and practice. [   ]

Only read about it [   ]

Not read about it but understand from practice [   ]

No knowledge about it [   ]

2.2. Do you have a formal risk analysis practice in your company before submission of tender and then after during construction?

Yes [   ]                      No [   ]

2.3. If your answer to the above question is yes, who performs in your company the risk analysis? (Please check ALL that apply.)

Risk manager within your organization [   ]

Design/Supervision Consultant [   ]

Independent risk consultant [   ]

Insurance broker(s) [   ]

Departmental personnel [   ]

Other (please specify below):

-----  
2.4. At what stage of project life-cycle do you perform the risk analysis of projects? (Please check ALL that apply.)

At the planning phase [   ]

At the end of conceptual design [   ]

At the end of preliminary Engineering design [   ]

At the end of final design [   ]

At the time of tendering [   ]

During construction phase [   ]

After completion of the construction [     ]

Other (please specify below)

-----

**2.5.** Which of the following methods do you often use to identify risks associated with a project? Rank them on the scale of 1 – 5 (from 1 = least to 5= most use).

| No | METHODS                                        | RANK |   |   |   |   |
|----|------------------------------------------------|------|---|---|---|---|
|    |                                                | 1    | 2 | 3 | 4 | 5 |
| 1  | Brainstorming amongst a project team           |      |   |   |   |   |
| 2  | By past experience /Analysis of prior projects |      |   |   |   |   |
| 3  | Judgment of the estimator/Quantity surveyor    |      |   |   |   |   |
| 4  | By the risk management department in the firm  |      |   |   |   |   |
| 5  | By the opinion of external consultant          |      |   |   |   |   |
| 6  | Checklists                                     |      |   |   |   |   |
| 7  | Visits to site                                 |      |   |   |   |   |
| 8  | Tender review by management                    |      |   |   |   |   |

Any other (state).....

**2.6.** If you conduct a formal risk assessment, what does the process consist of? (Please check ALL that apply.)

Just adding a percentage to budget/cost to cope with uncertainties [     ]

Identify major risk factors and quantify their impact subjectively [     ]

Use of various mathematical tools: such as sensitivity analysis, net present value etc. [     ]

Identify risk factors and quantify their impact using probability of occurrence, range of risk costs and simulation [     ]

Other (please specify below):

-----

**2.7.** Risk allocation is the apportionments of risks to those project/contracting parties who can best manage them and its objective can vary depending on unique project goals, but four fundamental tenets of sound risk allocation should always be followed:

- ✓ Allocate risks to the party best able manage them.
- ✓ Allocate the risk in alignment with project goals.

- ✓ Share risk when appropriate to accomplish project goals.
- ✓ Ultimately seek to allocate risks to promote team alignment with customer-oriented performance goals.

Based on your experience in the construction of road projects in Ethiopia, do you agree that those principles are adhered in the allocation of risks to parties in contract?

Strongly Agree, [    ]

Agree, [    ]

Neutral [    ]

Disagree [    ]

Strongly Disagree [    ]

Other opinion

-----  
-----  
-----

### **Section - III: Construction Insurance Practices**

**3.1.** Do you consider construction insurance provisions in your professional service to the Employer/Contractor?

Yes [    ]

No [    ]

**3.2.** Do you purchase insurance policies as part of your construction risks management in your road projects?

Yes [    ]

No [    ]

**3.3.** Please specify the percentage of price in your cost analysis for insurance coverage.

-----

**3.4.** Who assists with the insurance purchasing decision? (Please check ALL that apply.)

Internal staff [    ]

Design/Supervision Consultant [    ]

Outside risk management consultant [    ]

Insurance broker [    ]

Committee [    ]

Other (please specify below):

-----

**3.5.** Which of the following factors do you consider in determining whether a risk is insurable or not? Rank them on the scale of 1 – 5 (from 1=least to 5=most used).

| No | FACTORS                                   | RANK |   |   |   |   |
|----|-------------------------------------------|------|---|---|---|---|
|    |                                           | 1    | 2 | 3 | 4 | 5 |
| 1  | Past history of the risk                  |      |   |   |   |   |
| 2  | Easy to assess the extent of the damage   |      |   |   |   |   |
| 3  | Easy to determine the cause of the damage |      |   |   |   |   |
| 4  | Risks with high premiums                  |      |   |   |   |   |
| 5  | Difficult in assessing the risk premiums  |      |   |   |   |   |
| 6  | Unquantifiable risks                      |      |   |   |   |   |
| 7  | Foreseeable risks                         |      |   |   |   |   |
| 8  | Unforeseeable risks                       |      |   |   |   |   |

Any other (state).....

**3.6.** The following is a list of risk factors in construction. Please indicate by ticking which risks are insurable and those uninsurable in projects you were involved.

Then rank them on a scale of 1 to 5 points based on their effect on the project.

- ✓ Critical risk – five points – would cause program failure.
- ✓ Serious risk – four points – would cause major cost or schedule increases and secondary requirements may not be achieved.
- ✓ Moderate risk – three points – would cause moderate cost/schedule increases; important requirements would still be met.
- ✓ Minor risk – two points – would cause only small cost/schedule increases.
- ✓ Negligible risk – one point – would have no substantive effect on cost or schedule

| No | RISK FACTORS IN CONSTRUCTION                           | TICK      |             | RANK |   |   |   |   |
|----|--------------------------------------------------------|-----------|-------------|------|---|---|---|---|
|    |                                                        | INSURABLE | UNINSURABLE | 1    | 2 | 3 | 4 | 5 |
| 1  | Permits delayed or take longer than expected           |           |             |      |   |   |   |   |
| 2  | Pressure to deliver project on an accelerated schedule |           |             |      |   |   |   |   |
| 3  | Labour shortage                                        |           |             |      |   |   |   |   |
| 4  | Strikes and labour disputes                            |           |             |      |   |   |   |   |
| 5  | Low productivity                                       |           |             |      |   |   |   |   |
| 6  | Change orders/Variations                               |           |             |      |   |   |   |   |
| 7  | Unforeseen ground conditions                           |           |             |      |   |   |   |   |
| 8  | Inappropriate type of foundation                       |           |             |      |   |   |   |   |
| 9  | Errors in drawings                                     |           |             |      |   |   |   |   |
| 10 | Location and project restriction                       |           |             |      |   |   |   |   |
| 11 | Fluctuations (changes in cost)                         |           |             |      |   |   |   |   |

|    |                                                      |  |  |  |  |  |  |  |
|----|------------------------------------------------------|--|--|--|--|--|--|--|
| 12 | Long waiting time for approval of drawings           |  |  |  |  |  |  |  |
| 13 | Unrealistic contract duration                        |  |  |  |  |  |  |  |
| 14 | Delay in Payment to contractor for work done         |  |  |  |  |  |  |  |
| 15 | Inadequate client experience                         |  |  |  |  |  |  |  |
| 16 | Delay in design information                          |  |  |  |  |  |  |  |
| 17 | Mistakes and discrepancies in design documents       |  |  |  |  |  |  |  |
| 18 | Inadequate design team experience                    |  |  |  |  |  |  |  |
| 19 | Long waiting time for approval of test samples       |  |  |  |  |  |  |  |
| 20 | Injury to persons                                    |  |  |  |  |  |  |  |
| 21 | Injury to property                                   |  |  |  |  |  |  |  |
| 22 | Damages and delays during construction               |  |  |  |  |  |  |  |
| 23 | Contractor failure to enter into contract            |  |  |  |  |  |  |  |
| 24 | Shortage of materials in market                      |  |  |  |  |  |  |  |
| 25 | Inaccurate materials estimating                      |  |  |  |  |  |  |  |
| 26 | Poor site management and supervision                 |  |  |  |  |  |  |  |
| 27 | Inadequate contractor experience                     |  |  |  |  |  |  |  |
| 28 | Inadequate managerial skills                         |  |  |  |  |  |  |  |
| 29 | Defective work that must be removed and replaced     |  |  |  |  |  |  |  |
| 30 | Delays in subcontractors work                        |  |  |  |  |  |  |  |
| 31 | Shortage of liquidity                                |  |  |  |  |  |  |  |
| 32 | Shortage of plant/equipment                          |  |  |  |  |  |  |  |
| 33 | Inaccurate prediction of equipment production output |  |  |  |  |  |  |  |
| 34 | Weather                                              |  |  |  |  |  |  |  |
| 35 | Fire                                                 |  |  |  |  |  |  |  |
| 36 | Earth quake                                          |  |  |  |  |  |  |  |
| 37 | War                                                  |  |  |  |  |  |  |  |
| 38 | Nuclear weapons material                             |  |  |  |  |  |  |  |
| 39 | Radioactive materials                                |  |  |  |  |  |  |  |
| 40 | Extraordinary wind                                   |  |  |  |  |  |  |  |
| 41 | Heavy rain                                           |  |  |  |  |  |  |  |
| 42 | Frequent changes in law                              |  |  |  |  |  |  |  |
| 43 | Exchange rate fluctuation                            |  |  |  |  |  |  |  |
| 44 | Financial problem due to errors in Estimation        |  |  |  |  |  |  |  |
| 45 | Insufficient insurance                               |  |  |  |  |  |  |  |
| 46 | Theft                                                |  |  |  |  |  |  |  |
| 47 | Materials damage during transportation               |  |  |  |  |  |  |  |
| 48 | Interference by client                               |  |  |  |  |  |  |  |
| 49 | Poor construction method                             |  |  |  |  |  |  |  |
| 50 | Low productivity of subcontractors                   |  |  |  |  |  |  |  |

**3.7.** The following are insurance policies typically involved in construction projects.

Rank them, based on the most purchased in the Ethiopian road construction projects, on a scale of 1 to 5 (from 1=least to 5= most use).

| NO | INSURANCE POLICIES                          | RANK |   |   |   |   |
|----|---------------------------------------------|------|---|---|---|---|
|    |                                             | 1    | 2 | 3 | 4 | 5 |
| 1  | Contractor's All Risks Policy(CAR)          |      |   |   |   |   |
| 2  | Performance bonds and guarantees            |      |   |   |   |   |
| 3  | Professional Indemnity Insurance            |      |   |   |   |   |
| 4  | Workers compensation Insurance              |      |   |   |   |   |
| 5  | Comprehensive Commercial vehicles Insurance |      |   |   |   |   |
| 6  | Public liability Insurance                  |      |   |   |   |   |
| 7  | Employers' liability Insurance              |      |   |   |   |   |

|    |                                                       |  |  |  |  |  |
|----|-------------------------------------------------------|--|--|--|--|--|
| 8  | Fidelity guarantee                                    |  |  |  |  |  |
| 9  | Third party liability insurance                       |  |  |  |  |  |
| 10 | Fire perils insurance on premises and contents        |  |  |  |  |  |
| 11 | Bid bond                                              |  |  |  |  |  |
| 12 | Goods in transit and Marine Insurance                 |  |  |  |  |  |
| 13 | Earthquake Insurance                                  |  |  |  |  |  |
| 14 | Contractor's Protective Public and Property Insurance |  |  |  |  |  |
| 15 | Decennial or Inherent Defect Policy insurance         |  |  |  |  |  |
| 16 | Group Life Insurance                                  |  |  |  |  |  |
| 17 | Major Medical Insurance                               |  |  |  |  |  |
| 18 | Plant and Equipment Insurance                         |  |  |  |  |  |

Other (Please specify below):

---

**3.8. Why do you provide the above insurance cover? Tick all those applicable**

To meet the demand of the client [ ]

To transfer risk [ ]

To reduce the impact of any disaster during construction [ ]

To meet tender and contract requirement [ ]

Recommendation of insurance advisor [ ]

Other (please specify below):

-----

**3.9. Which of the following insurance groups do you deal with when insuring your project?**

Insurance company [ ], Insurance agent [ ], Insurance broker [ ]

Any other (state).....

**3.10. Which of the following problems or concerns are faced with respect to insurance provisions in the Ethiopian road construction industry?**

Tick all those applicable

Rising cost of premiums [ ]

Fewer companies willing to insure [ ],

Complex policy language [ ],

Lack of proper coverage or exclusion [ ],

High collateral demands by insurance companies [ ],

Lack of knowledge in insurance [    ]

Impact of reinsurer cost on the premium [    ]

**3.11.** Do you normally interact with insurance companies in risk identification, allocation and insurance policies before or during construction?

Yes [    ]

No [    ]

**3.12.** Do the insurance companies visit the project site before issuing the insurance coverage or during construction?

Yes [    ]

No [    ]

**3.13.** Have you ever encountered any severe accident/damage during construction of road projects you were involved in relation to your professional service?

Yes [    ]

No [    ]

If your answer is yes, please describe the extent of the damage occurred and how the damage remedied (if possible in monetary terms)

-----  
-----  
-----

**3.14.** Do you have professional indemnity insurance for the service you deliver?

Yes [    ]

No [    ]

If your answer is No, please indicate your reasons hereunder:

-----  
-----  
-----  
---

**3.15.** What is your opinion on the role of insurance in the development of the road sector in Ethiopia?

Very important [    ]

Important [    ]

Average [    ]

Low [    ]

None [    ]

**3.16.** What are your overall suggestions on Construction Risks Management through Insurance practices in the Ethiopian road construction projects?

-----

-----  
-----  
**3.17.** Any other comments you wish to provide:

-----  
-----  
-----  
-----

***I sincerely appreciate your timely response and cooperation.***

Thank You!!

### **3. Questionnaire for Contractors**

#### **Section - I: Company and Respondent Profile**

(Please indicate with “√” when appropriate)

**3.1.** Company Name (optional):-----

**1.2.** Type or origin of your organization

Foreign Contractor [    ]    Domestic Contractor [    ]

Others (please specify) -----

Year of establishment: < 5 years [    ]    6-10 years [    ]    10-15 years [    ] >15years [    ]

Please indicate classification/category of your company belong to (If applicable);

Grade/Category- 1 [    ]    Grade/Category- 2 [    ]    Grade/Category- 3 [    ]

Others (please specify) -----

**1.3.** If Foreign Contractor, how long has your organization been involved in the Ethiopian Road Construction Sector?

Less than 5 years [    ]    6-10 years [    ]    More than 10 years [    ]

**1.4.** In your company/agency, which position in the organizational level you are?

Top management [    ]    Middle management [    ]    Expert [    ]    others [    ]

**1.5.** Please indicate your area of specialization as far as practicing in the road construction industry is concerned

Project Management [    ]    Structural Engineering [    ]    Quantity surveying [    ]    Safety [    ]  
[    ] any other (state).....

**1.6.** How long have you been involved in the road sector projects?

Less than 5 years [    ]    6-10 years [    ]    More than 10 years [    ]

**1.7.** How many road projects have you been involved in?

Less than 5 projects [    ]    6-10 projects [    ]    More than 10 projects [    ]

**1.8.** What is your present capital? -----

**1.9.** What are the numbers of major construction equipment owned by your company?

-----

**1.10.** How many employees do you have? -----

## **Section-II: Basic Information on Road Construction Risk Management**

**2.1.** Please indicate your level of understanding of the concept of risk management practices

Understand deeply through reading and practice. [    ]

Only read about it [    ]

Not read about it but understand from practice [    ]

No knowledge about it [    ]

**2.2.** Do you have a formal risk analysis practice in your company before submission of tender and then after during construction?

Yes [    ]                      No [    ]

**2.3.** If your answer to the above question is yes, who performs in your company the risk analysis? (Please check ALL that apply.)

Risk manager within your organization [    ]

Safety officer(s) within your organization [    ]

Independent risk consultant [    ]

Insurance broker(s) [    ]

Departmental personnel [    ]

Other (please specify below):

-----

**2.4.** At what stage of project life-cycle do you perform the risk analysis? (Please check ALL that apply.)

At the planning phase [    ]

At the end of conceptual design [    ]

At the end of preliminary Engineering design [    ]

At the end of final design [    ]

At the time of tendering [    ]

During construction phase [    ]

After completion of the construction [    ]

Other (please specify below)

-----

**2.5.** Which of the following methods do you often use to identify risks associated with a project? Rank them on the scale of 1 – 5 (from 1 = least to 5= most use).

| No | METHODS                                        | RANK |   |   |   |   |
|----|------------------------------------------------|------|---|---|---|---|
|    |                                                | 1    | 2 | 3 | 4 | 5 |
| 1  | Brainstorming amongst a project team           |      |   |   |   |   |
| 2  | By past experience /Analysis of prior projects |      |   |   |   |   |
| 3  | Judgment of the estimator/Quantity surveyor    |      |   |   |   |   |
| 4  | By the risk management department in the firm  |      |   |   |   |   |
| 5  | By the opinion of external consultant          |      |   |   |   |   |
| 6  | Checklists                                     |      |   |   |   |   |
| 7  | Visits to site                                 |      |   |   |   |   |
| 8  | Tender review by management                    |      |   |   |   |   |

Any other (state).....

**2.6.** If you conduct a formal risk assessment, what does the process consist of? (Please check ALL that apply.)

Just adding a percentage to budget/cost to cope with uncertainties [    ]

Identify major risk factors and quantify their impact subjectively [    ]

Use of various mathematical tools: such as sensitivity analysis, net present value etc. [    ]

Identify risk factors and quantify their impact using probability of occurrence, range of risk costs and simulation [    ]

Other (please specify below):

-----

**2.7.** Risk allocation is the apportionments of risks to those project/contracting parties who can best manage them and its objective can vary depending on unique project goals, but four fundamental tenets of sound risk allocation should always be followed:

- ✓ Allocate risks to the party best able manage them.
- ✓ Allocate the risk in alignment with project goals.

- ✓ Share risk when appropriate to accomplish project goals.
- ✓ Ultimately seek to allocate risks to promote team alignment with customer-oriented performance goals.

Based on your experience in the construction of road projects in Ethiopia do you agree that those principles are adhered in the allocation of risks to parties in contract?

Strongly Agree, [    ]

Agree, [    ]

Neutral [    ]

Disagree [    ]

Strongly Disagree [    ]

Other opinion

-----  
-----  
-----

### **Section - III: Construction Insurance Practices**

**3.1.** Do you consider construction insurance provisions in your contract conditions in the selection of Contractors/Subcontractors or Consultants?

Yes [    ]

No [    ]

**3.2.** Do you purchase insurance policies as part of your construction risks management in your road projects?

Yes [    ]

No [    ]

**3.3.** Please specify the percentage of price in your cost analysis for insurance coverage

-----

**3.4.** Who assists with the insurance purchasing decision? (Please check ALL that apply.)

Internal staff [    ]

Design/Supervision Consultant [    ]

Outside risk management consultant [    ]

Insurance broker [    ]

Committee [    ]

Other (please specify below):

-----

**3.5.** Which of the following factors do you consider in determining whether a risk is insurable or not? Rank them on the scale of 1 – 5 (from 1=least to 5=most used).

| No | FACTORS                                   | RANK |   |   |   |   |
|----|-------------------------------------------|------|---|---|---|---|
|    |                                           | 1    | 2 | 3 | 4 | 5 |
| 1  | Past history of the risk                  |      |   |   |   |   |
| 2  | Easy to assess the extent of the damage   |      |   |   |   |   |
| 3  | Easy to determine the cause of the damage |      |   |   |   |   |
| 4  | Risks with high premiums                  |      |   |   |   |   |
| 5  | Difficult in assessing the risk premiums  |      |   |   |   |   |
| 6  | Unquantifiable risks                      |      |   |   |   |   |
| 7  | Foreseeable risks                         |      |   |   |   |   |
| 8  | Unforeseeable risks                       |      |   |   |   |   |

Any other (state).....

**3.6.** The following is a list of risk factors in construction. Please indicate by ticking which risks are insurable and those uninsurable in projects undertaken by you.

Then rank them on a scale of 1 to 5 points based on their effect on the project.

- ✓ Critical risk – five points – would cause program failure.
- ✓ Serious risk – four points – would cause major cost or schedule increases and secondary requirements may not be achieved.
- ✓ Moderate risk – three points – would cause moderate cost/schedule increases; important requirements would still be met.
- ✓ Minor risk – two points – would cause only small cost/schedule increases.
- ✓ Negligible risk – one point – would have no substantive effect on cost or schedule

| NO | RISK FACTORS IN CONSTRUCTION                           | TICK      |             | RANK |   |   |   |   |
|----|--------------------------------------------------------|-----------|-------------|------|---|---|---|---|
|    |                                                        | INSURABLE | UNINSURABLE | 1    | 2 | 3 | 4 | 5 |
| 1  | Permits delayed or take longer than expected           |           |             |      |   |   |   |   |
| 2  | Pressure to deliver project on an accelerated schedule |           |             |      |   |   |   |   |
| 3  | Labour shortage                                        |           |             |      |   |   |   |   |
| 4  | Strikes and labour disputes                            |           |             |      |   |   |   |   |
| 5  | Low productivity                                       |           |             |      |   |   |   |   |
| 6  | Change orders/Variations                               |           |             |      |   |   |   |   |
| 7  | Unforeseen ground conditions                           |           |             |      |   |   |   |   |
| 8  | Inappropriate type of foundation                       |           |             |      |   |   |   |   |
| 9  | Errors in drawings                                     |           |             |      |   |   |   |   |
| 10 | Location and project restriction                       |           |             |      |   |   |   |   |
| 11 | Fluctuations (changes in cost)                         |           |             |      |   |   |   |   |

|    |                                                      |  |  |  |  |  |  |  |
|----|------------------------------------------------------|--|--|--|--|--|--|--|
| 12 | Long waiting time for approval of drawings           |  |  |  |  |  |  |  |
| 13 | Unrealistic contract duration                        |  |  |  |  |  |  |  |
| 14 | Delay in Payment to contractor for work done         |  |  |  |  |  |  |  |
| 15 | Inadequate client experience                         |  |  |  |  |  |  |  |
| 16 | Delay in design information                          |  |  |  |  |  |  |  |
| 17 | Mistakes and discrepancies in design documents       |  |  |  |  |  |  |  |
| 18 | Inadequate design team experience                    |  |  |  |  |  |  |  |
| 19 | Long waiting time for approval of test samples       |  |  |  |  |  |  |  |
| 20 | Injury to persons                                    |  |  |  |  |  |  |  |
| 21 | Injury to property                                   |  |  |  |  |  |  |  |
| 22 | Damages and delays during construction               |  |  |  |  |  |  |  |
| 23 | Contractor failure to enter into contract            |  |  |  |  |  |  |  |
| 24 | Shortage of materials in market                      |  |  |  |  |  |  |  |
| 25 | Inaccurate materials estimating                      |  |  |  |  |  |  |  |
| 26 | Poor site management and supervision                 |  |  |  |  |  |  |  |
| 27 | Inadequate contractor experience                     |  |  |  |  |  |  |  |
| 28 | Inadequate managerial skills                         |  |  |  |  |  |  |  |
| 29 | Defective work that must be removed and replaced     |  |  |  |  |  |  |  |
| 30 | Delays in subcontractors work                        |  |  |  |  |  |  |  |
| 31 | Shortage of liquidity                                |  |  |  |  |  |  |  |
| 32 | Shortage of plant/equipment                          |  |  |  |  |  |  |  |
| 33 | Inaccurate prediction of equipment production output |  |  |  |  |  |  |  |
| 34 | Weather                                              |  |  |  |  |  |  |  |
| 35 | Fire                                                 |  |  |  |  |  |  |  |
| 36 | Earth quake                                          |  |  |  |  |  |  |  |
| 37 | War                                                  |  |  |  |  |  |  |  |
| 38 | Nuclear weapons material                             |  |  |  |  |  |  |  |
| 39 | Radioactive materials                                |  |  |  |  |  |  |  |
| 40 | Extraordinary wind                                   |  |  |  |  |  |  |  |
| 41 | Heavy rain                                           |  |  |  |  |  |  |  |
| 42 | Frequent changes in law                              |  |  |  |  |  |  |  |
| 43 | Exchange rate fluctuation                            |  |  |  |  |  |  |  |
| 44 | Financial problem due to errors in Estimation        |  |  |  |  |  |  |  |
| 45 | Insufficient insurance                               |  |  |  |  |  |  |  |
| 46 | Theft                                                |  |  |  |  |  |  |  |
| 47 | Materials damage during transportation               |  |  |  |  |  |  |  |
| 48 | Interference by client                               |  |  |  |  |  |  |  |
| 49 | Poor construction method                             |  |  |  |  |  |  |  |
| 50 | Low productivity of subcontractors                   |  |  |  |  |  |  |  |

**3.7.** The following are insurance policies typically involved in construction projects.  
Rank them, based on the most purchased, on a scale of 1 to 5 (from 1=least to 5= most use).

| NO | INSURANCE POLICIES                          | RANK |   |   |   |   |
|----|---------------------------------------------|------|---|---|---|---|
|    |                                             | 1    | 2 | 3 | 4 | 5 |
| 1  | Contractor's All Risks Policy(CAR)          |      |   |   |   |   |
| 2  | Performance bonds and guarantees            |      |   |   |   |   |
| 3  | Professional Indemnity Insurance            |      |   |   |   |   |
| 4  | Workers compensation Insurance              |      |   |   |   |   |
| 5  | Comprehensive Commercial vehicles Insurance |      |   |   |   |   |
| 6  | Public liability Insurance                  |      |   |   |   |   |
| 7  | Employers' liability Insurance              |      |   |   |   |   |
| 8  | Fidelity guarantee                          |      |   |   |   |   |
| 9  | Third party liability insurance             |      |   |   |   |   |

|    |                                                       |  |  |  |  |  |
|----|-------------------------------------------------------|--|--|--|--|--|
| 10 | Fire perils insurance on premises and contents        |  |  |  |  |  |
| 11 | Bid bond                                              |  |  |  |  |  |
| 12 | Goods in transit and Marine Insurance                 |  |  |  |  |  |
| 13 | Earthquake Insurance                                  |  |  |  |  |  |
| 14 | Contractor's Protective Public and Property Insurance |  |  |  |  |  |
| 15 | Decennial or Inherent Defect Policy insurance         |  |  |  |  |  |
| 16 | Group Life Insurance                                  |  |  |  |  |  |
| 17 | Major Medical Insurance                               |  |  |  |  |  |
| 18 | Plant and Equipment Insurance                         |  |  |  |  |  |

Other (Please specify below):

---

**3.8. Why do you provide the above insurance cover? Tick all those applicable**

To meet the demand of the client [ ]

To transfer risk [ ]

To reduce the impact of any disaster during construction [ ]

To meet tender and contract requirement [ ]

Recommendation of insurance advisor [ ]

Other (please specify below):

-----

**3.9. Which of the following insurance groups do you deal with when insuring your project?**

Insurance company [ ], Insurance agent [ ], Insurance broker [ ]

Any other (state).....

**3.10. Which of the following problems or concerns are faced with respect to insurance provisions in the Ethiopian road construction industry?**

Tick all those applicable

Rising cost of premiums [ ]

Fewer companies willing to insure [ ],

Complex policy language [ ],

Lack of proper coverage or exclusion [ ],

High collateral demands by insurance companies [ ],

Lack of knowledge in insurance [ ]

Impact of reinsurer cost on the premium [ ]

**3.11.** Do you normally interact with insurance companies in risk identification, allocation and insurance policies before or during construction?

Yes [    ]

No [    ]

**3.12.** Do the insurance companies visit the project site before issuing the insurance coverage and during construction?

Yes [    ]

No [    ]

**3.13.** Have you ever encountered any severe accident/damage during construction of road projects you were involved?

Yes [    ]

No [    ]

If your answer is yes, please describe the extent of the damage occurred and how the damage remedied (if possible in monetary terms)

-----  
-----  
-----

**3.14.** Do you have any damage occurred in your road projects and compensated/denied by insurance claims?

Yes [    ]

No [    ]

If your answer is yes, please indicate the amount of compensation you received in a monetary terms

-----  
-----  
-----

**3.15.** What is your opinion on the role of insurance in the development of the road sector in Ethiopia?

Very important [    ]

Important [    ]

Average [    ]

Low [    ]

None [    ]

**3.16.** What are your overall suggestions on Construction Risks Management through Insurance practices in the Ethiopian road construction projects?

-----

-----  
-----  
**3.17.** Any other comments you wish to provide:

-----  
-----  
-----  
-----

***I sincerely appreciate your timely response and cooperation.***

Thank You!!

## **4. Questionnaire for Insurance Company**

### **Section - I: Company and Respondent Profile**

(Please indicate with “√” when appropriate)

**4.1.** Company Name (optional):-----

**1.2.** Type or origin of your organization

(Please specify) -----

Year of establishment: < 5 years [    ] 6-10 years [    ] 10-15 years [    ] >15years [    ]

**1.3.** In your company/agency, which position in the organizational level you are?

Top management [    ] Middle management [    ] Expert [    ] others -----

**1.4.** How long have you been in business relation with the road sector projects?

Less than 5 years [    ] 6-10 years [    ] More than 10 years [    ]

**1.5.** What is your present capital? -----

### **Section 2: Basic Information on Road Construction Projects Risk Management**

**2.1.** Indicate your level of understanding of the concept of risk management practices

Understand deeply through reading and practice. [    ]

Only read about it [    ]

Not read about it but understand from practice [    ]

No knowledge about it [    ]

**2.2.** Do you have a risk analysis practice in your construction related insurance service to Employer, Contractors and Consultants?

Yes [    ]

No [    ]

**2.3.** How the premium of a typical road project’s risk insurance is fixed?

Detail study of the project [    ]

Previous experience [    ]

Expert estimate [    ]

Contract amount [    ]

Location of the project [    ]

Other (please specify below)

-----  
 -----  
 -----  
 -----

**2.4.** Do you normally interact with construction companies in risk identification, allocation and insurance policies before or during construction?

Yes [    ]

No [    ]

**2.5.** Does your insurance company visit the project site before issuing the insurance cover and during construction?

Yes [    ]

No [    ]

### Section 3: Construction Insurance Practices

**3.1.** Please indicate below the number of your customers from the road sector purchasing construction insurances:

- a) Contractors -----
- b) Design Consultant-----
- c) Supervision Consultants-----

**3.2.** Which of the following factors do you consider in determining whether a risk is insurable or not? Rank them on the scale of 1 – 5 (from 1=least to 5=most used).

| No | FACTORS                                   | RANK |   |   |   |   |
|----|-------------------------------------------|------|---|---|---|---|
|    |                                           | 1    | 2 | 3 | 4 | 5 |
| 1  | Past history of the risk                  |      |   |   |   |   |
| 2  | Easy to assess the extent of the damage   |      |   |   |   |   |
| 3  | Easy to determine the cause of the damage |      |   |   |   |   |
| 4  | Risks with high premiums                  |      |   |   |   |   |
| 5  | Difficult in assessing the risk premiums  |      |   |   |   |   |
| 6  | Unquantifiable risks                      |      |   |   |   |   |
| 7  | Foreseeable risks                         |      |   |   |   |   |
| 8  | Unforeseeable risks                       |      |   |   |   |   |

Any other (state).....

**3.3.** The following is a list of risk factors in construction. Please indicate by ticking which risks are insurable and those uninsurable in projects undertaken by you.

Then rank them on a scale of 1 to 5 points based on their effect on the project.

- ✓ Critical risk – five points – would cause program failure.
- ✓ Serious risk – four points – would cause major cost or schedule increases and secondary requirements may not be achieved.
- ✓ Moderate risk – three points – would cause moderate cost/schedule increases; important requirements would still be met.
- ✓ Minor risk – two points – would cause only small cost/schedule increases.
- ✓ Negligible risk – one point – would have no substantive effect on cost or schedule

| No | RISK FACTORS IN CONSTRUCTION                           | TICK      |             | RANK |   |   |   |   |
|----|--------------------------------------------------------|-----------|-------------|------|---|---|---|---|
|    |                                                        | INSURABLE | UNINSURABLE | 1    | 2 | 3 | 4 | 5 |
| 1  | Permits delayed or take longer than expected           |           |             |      |   |   |   |   |
| 2  | Pressure to deliver project on an accelerated schedule |           |             |      |   |   |   |   |
| 3  | Labour shortage                                        |           |             |      |   |   |   |   |
| 4  | Strikes and labour disputes                            |           |             |      |   |   |   |   |
| 5  | Low productivity                                       |           |             |      |   |   |   |   |
| 6  | Change orders/Variations                               |           |             |      |   |   |   |   |
| 7  | Unforeseen ground conditions                           |           |             |      |   |   |   |   |
| 8  | Inappropriate type of foundation                       |           |             |      |   |   |   |   |
| 9  | Errors in drawings                                     |           |             |      |   |   |   |   |
| 10 | Location and project restriction                       |           |             |      |   |   |   |   |
| 11 | Fluctuations (changes in cost)                         |           |             |      |   |   |   |   |
| 12 | Long waiting time for approval of drawings             |           |             |      |   |   |   |   |
| 13 | Unrealistic contract duration                          |           |             |      |   |   |   |   |
| 14 | Delay in Payment to contractor for work done           |           |             |      |   |   |   |   |
| 15 | Inadequate client experience                           |           |             |      |   |   |   |   |
| 16 | Delay in design information                            |           |             |      |   |   |   |   |
| 17 | Mistakes and discrepancies in design documents         |           |             |      |   |   |   |   |
| 18 | Inadequate design team experience                      |           |             |      |   |   |   |   |
| 19 | Long waiting time for approval of test samples         |           |             |      |   |   |   |   |
| 20 | Injury to persons                                      |           |             |      |   |   |   |   |
| 21 | Injury to property                                     |           |             |      |   |   |   |   |
| 22 | Damages and delays during construction                 |           |             |      |   |   |   |   |
| 23 | Contractor failure to enter into contract              |           |             |      |   |   |   |   |
| 24 | Shortage of materials in market                        |           |             |      |   |   |   |   |
| 25 | Inaccurate materials estimating                        |           |             |      |   |   |   |   |
| 26 | Poor site management and supervision                   |           |             |      |   |   |   |   |
| 27 | Inadequate contractor experience                       |           |             |      |   |   |   |   |
| 28 | Inadequate managerial skills                           |           |             |      |   |   |   |   |
| 29 | Defective work that must be removed and replaced       |           |             |      |   |   |   |   |
| 30 | Delays in subcontractors work                          |           |             |      |   |   |   |   |
| 31 | Shortage of liquidity                                  |           |             |      |   |   |   |   |
| 32 | Shortage of plant/equipment                            |           |             |      |   |   |   |   |
| 33 | Inaccurate prediction of equipment production output   |           |             |      |   |   |   |   |
| 34 | Weather                                                |           |             |      |   |   |   |   |
| 35 | Fire                                                   |           |             |      |   |   |   |   |

|    |                                               |  |  |  |  |  |  |  |
|----|-----------------------------------------------|--|--|--|--|--|--|--|
| 36 | Earth quake                                   |  |  |  |  |  |  |  |
| 37 | War                                           |  |  |  |  |  |  |  |
| 38 | Nuclear weapons material                      |  |  |  |  |  |  |  |
| 39 | Radioactive materials                         |  |  |  |  |  |  |  |
| 40 | Extraordinary wind                            |  |  |  |  |  |  |  |
| 41 | Heavy rain                                    |  |  |  |  |  |  |  |
| 42 | Frequent changes in law                       |  |  |  |  |  |  |  |
| 43 | Exchange rate fluctuation                     |  |  |  |  |  |  |  |
| 44 | Financial problem due to errors in Estimation |  |  |  |  |  |  |  |
| 45 | Insufficient insurance                        |  |  |  |  |  |  |  |
| 46 | Theft                                         |  |  |  |  |  |  |  |
| 47 | Materials damage during transportation        |  |  |  |  |  |  |  |
| 48 | Interference by client                        |  |  |  |  |  |  |  |
| 49 | Poor construction method                      |  |  |  |  |  |  |  |
| 50 | Low productivity of subcontractors            |  |  |  |  |  |  |  |

**3.4.** The following are insurance policies typically involved in construction projects. Rank them, based on the most purchased, on a scale of 1 to 5 (from 1=least to 5= most use).

| NO. | INSURANCE POLICIES                                    | RANK |   |   |   |   |
|-----|-------------------------------------------------------|------|---|---|---|---|
|     |                                                       | 1    | 2 | 3 | 4 | 5 |
| 1   | Contractor's All Risks Policy(CAR)                    |      |   |   |   |   |
| 2   | Performance bonds and guarantees                      |      |   |   |   |   |
| 3   | Professional Indemnity Insurance                      |      |   |   |   |   |
| 4   | Workers compensation Insurance                        |      |   |   |   |   |
| 5   | Comprehensive Commercial vehicles Insurance           |      |   |   |   |   |
| 6   | Public liability insurance                            |      |   |   |   |   |
| 7   | Employers' liability Insurance                        |      |   |   |   |   |
| 8   | Fidelity guarantee                                    |      |   |   |   |   |
| 9   | Third party liability insurance                       |      |   |   |   |   |
| 10  | Fire perils insurance on premises and contents        |      |   |   |   |   |
| 11  | Bid bond                                              |      |   |   |   |   |
| 12  | Goods in transit and Marine Insurance                 |      |   |   |   |   |
| 13  | Earthquake Insurance                                  |      |   |   |   |   |
| 14  | Contractor's Protective Public and Property Insurance |      |   |   |   |   |
| 15  | Decennial or Inherent Defect Insurance                |      |   |   |   |   |
| 16  | Group Life Insurance                                  |      |   |   |   |   |
| 17  | Major Medical Insurance                               |      |   |   |   |   |
| 18  | Plant and Equipment Insurance                         |      |   |   |   |   |

Other (Please specify below):

-----

**3.5.** Which of the following problems or concerns are faced with respect to insurance

provisions in the Ethiopian road construction industry?

Tick all those applicable

Rising cost of premiums [ ]

Fewer companies willing to insure [ ],

Complex policy language [10],

Lack of proper coverage or exclusion [     ],

High collateral demands by insurance companies [    ],

Lack of knowledge in insurance [ ]

Impact of reinsurer cost on the premium [ ]

**3.6.** Do you think the amount of premium requested for typical construction insurance is reasonable and affordable to the extent of coverage?

Yes [ ]

No [ ]

**3.7. Please indicate below the number of major compensations effected to Employers/Clients, Contractors and Consultants for damages in relation to construction insurances in the past ten years:**

a) Employer/Client-----

b) Contractors -----

c) Design Consultants-----

d) Supervision Consultants-----

**3.8.** Do you have any dispute with Employers/Clients, Contractors and Consultants because of disagreement on the amount of compensations, based on liability or other?

Yes [ ]

No [ ]

If your answer is yes, please indicate the number of major disputes in the past ten years:

a) Contractors -----

b) Design Consultant-----

c) Supervision Consultants-----

**3.9.** What is your opinion on the role of insurance in the development of the road sector in Ethiopia?

Very important [ ]

Important [ ]

Average [ ]

Low [ ]

None [ ]

**3.10.** What are your overall suggestions on Construction Risks Management through Insurance practices in the Ethiopian road construction projects?

---

---

---

**3.11.** Any other comments you wish to provide:

---

---

---

---

*I sincerely appreciate your timely response and cooperation.*

Thank You!!