

**AN ASSESSMENT OF RISK ALLOCATION AND MITIGATION PRACTICES IN
PUBLIC ROAD CONSTRUCTION PROJECTS IN UGANDA: A CASE STUDY OF
SELECTED PROJECTS IN THE ELGON REGION**

OGIK ALFRED

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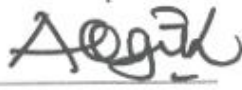
**A DISSERTATION SUBMITTED TO THE COLLEGE OF
BUSINESS AND MANAGEMENT SCIENCES FOR THE AWARD OF
MASTERS IN PUBLIC INFRASTRUCTURE MANAGMENT OF
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DECLARATION

I, **Ogik Alfred**, declare that this dissertation titled "*An Assessment of Risk Allocation and Mitigation Practices in Public Road Construction Projects in Uganda: A Case Study of Selected Projects in the Elgon Region*" is my original work and has never been submitted to any university or institution of higher learning for the award of any academic qualification.

All sources of information used in this study have been duly acknowledged and referenced in accordance with academic requirements.

Signature: 

Date: 17/7/2026

APPROVAL

This dissertation titled "*An Assessment of Risk Allocation and Mitigation Practices in Public Road Construction Projects in Uganda: A Case Study of Selected Projects in the Elgon Region*" has been submitted for examination with my approval as the candidate's supervisor

Supervisor

Name: Dr. Sarah Bimbona (PhD)

Signature: _____

Date: _____


17/7/2026

DEDICATION

This dissertation is dedicated to my beloved parents for their unwavering love, sacrifices, guidance, and encouragement throughout my academic journey. Their commitment to my education and personal development has been a constant source of inspiration.

I especially dedicate this work to my father, whose deep appreciation for education and belief in the transformative power of knowledge inspired me to pursue academic excellence. His wisdom, resilience, and dedication to ensuring that I received a quality education have greatly shaped my aspirations and achievements.

This work is also dedicated to my family, friends, and all those who have continuously supported and encouraged me throughout the course of my studies.

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LIST OF ACRONYMS

ADB	African Development Bank
AG	Auditor General
BoQ	Bill of Quantities
FIDIC	International Federation of Consulting Engineers
GIS	Geographic Information System
GoU	Government of Uganda
KII	Key Informant Interview
MoWT	Ministry of Works and Transport
NDP	National Development Plan
NEMA	National Environment Management Authority
NPA	National Planning Authority
PPDA	Public Procurement and Disposal of Public Assets Authority
PMI	Project Management Institute
PMP	Project Management Professional
RAP	Resettlement Action Plan
RII	Relative Importance Index
SPSS	Statistical Package for the Social Sciences
UNMA	Uganda National Meteorological Authority
UNRA	Uganda National Roads Authority
USD	United States Dollar
WB	World Bank

ABSTRACT

Public road construction projects play a critical role in supporting socio-economic development through improved transportation, connectivity, and access to essential services. Despite significant public investment in road infrastructure in Uganda, many projects continue to experience delays, cost overruns, quality deficiencies, and contractual disputes, partly due to weaknesses in risk allocation and mitigation practices. This study assessed risk allocation and mitigation practices in public road construction projects in Uganda, with specific focus on selected projects in the Elgon Region.

The study was guided by five objectives: to evaluate the effectiveness of risk allocation practices, examine challenges affecting effective risk allocation, assess the effectiveness of risk mitigation strategies, identify challenges hindering implementation of risk mitigation measures, and propose recommendations for improving risk allocation and mitigation practices. The study adopted a mixed-methods research approach using a cross-sectional research design. Quantitative data were collected from 80 respondents out of a targeted sample of 97 project stakeholders, representing a response rate of 82.5%, while qualitative data were obtained from 10 key informants out of a targeted 15, representing a response rate of 66.7%. Data were collected using questionnaires and key informant interviews and analyzed using descriptive statistics and thematic analysis.

The findings revealed that risk allocation practices were generally effective, with an aggregate mean score of 4.05. Respondents agreed that effective risk allocation improves project performance (Mean = 4.29), contributes to timely project completion (Mean = 4.26), and reduces disputes among stakeholders (Mean = 4.14). However, environmental risks were found to be less effectively allocated compared to other categories of risks. The study further established that political influence (Mean = 4.32), delayed decision-making (Mean = 4.24), institutional weaknesses (Mean = 4.20), and unclear contractual provisions (Mean = 4.18) were major challenges affecting effective risk allocation.

The findings also indicated that risk mitigation strategies were generally effective, with an aggregate mean score of 4.18. Geotechnical investigations (Mean = 4.35), contingency planning (Mean = 4.20), project supervision mechanisms (Mean = 4.18), and environmental management plans (Mean = 4.10) were identified as important mitigation measures contributing to improved project outcomes. However, implementation of mitigation strategies was constrained by delayed government funding (Mean = 4.41), environmental uncertainties (Mean = 4.33), institutional capacity limitations (Mean = 4.18), weak monitoring systems (Mean = 4.15), and poor stakeholder coordination (Mean = 4.12).

The study concludes that effective risk allocation and mitigation practices significantly contribute to improved performance of public road construction projects. However, governance challenges, institutional weaknesses, funding delays, and environmental uncertainties continue to undermine effective risk management. The study recommends strengthening contractual risk allocation frameworks, enhancing institutional capacity, improving project financing mechanisms, strengthening monitoring and evaluation systems, increasing stakeholder participation, and adopting modern risk management technologies to improve infrastructure project performance.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Public road construction projects are essential for Uganda's socio-economic developments because they facilitate the movement of goods and services, improve access to markets, education and health services, and enhance regional trade and connectivity (African Development Bank, 2021; World Bank, 2020). However, such projects are exposed to multiple risks including financial, technical, environmental, contractual, and institutional risks that can affect project performance (Flyvbjerg, 2023; Hillson & Simon, 2020). The allocation of these risks among project stakeholders and the mitigation strategies adopted during project implementation play a critical role in determining outcomes such as project cost, completion time, infrastructure quality, and sustainability (Project Management Institute, 2021; El-Sayegh et al., 2022). Risk allocation refers to assigning responsibility for managing specific risks among contracting parties, while risk mitigation involves measures aimed at reducing the likelihood or impact of these risks (Project Management Institute, 2021; Yescombe, 2018). Despite significant government investment in road infrastructure, many public road projects in Uganda continue to experience delays, cost overruns, and quality challenges partly due to weaknesses in risk allocation and mitigation practices (Auditor General, 2023; Ministry of Works and Transport, 2022). This study assessed risk allocation and mitigation practices in public road construction projects in Uganda, with a focus on projects in the Elgon Region.

1.2 Background to the Study

Infrastructure development remains a central driver of economic growth, productivity, and social transformation across the world. Globally, governments invest heavily in transport infrastructure to stimulate trade, reduce transaction costs, and enhance regional integration. However, infrastructure projects are widely recognized as high risk undertakings due to their scale, technical complexity, financial exposure, and institutional interdependencies (Flyvbjerg, 2023). Empirical evidence shows that a significant proportion of large infrastructure projects experience cost overruns and schedule delays, with average cost overruns ranging between 20 percent and 45 percent depending on project type and context (Flyvbjerg, 2023). These performance challenges

are often associated with inadequate risk identification, weak contractual risk allocation, optimism bias, and insufficient mitigation planning (Project Management Institute [PMI], 2021).

Best practice in project and contract management emphasizes that risks should be systematically identified, assessed, allocated to the party best able to manage them, and actively mitigated throughout the project life cycle (PMI, 2021; Yescombe, 2018). When risks are improperly allocated or transferred without corresponding capacity, projects tend to experience adversarial relationships, claims, disputes, renegotiations, and inefficiencies (El-Sayegh et al., 2022). Consequently, risk allocation and mitigation practices have become central concerns in global infrastructure governance and contract design.

At the continental level, Africa faces substantial infrastructure deficits that constrain economic transformation. The African Development Bank estimates that the continent requires between USD 130 and 170 billion annually to meet its infrastructure needs, with a financing gap of up to USD 108 billion per year (African Development Bank, 2021). Roads constitute the backbone of transport systems in Africa, accounting for nearly 80 percent of passenger and freight movement, yet only about 30 percent of the continent's road network is paved (African Development Bank, 2021). Infrastructure projects across Sub Saharan Africa frequently encounter risks related to volatile construction material prices, delayed government payments, land acquisition disputes, weak institutional capacity, and climate variability (World Bank, 2020). Studies conducted in African construction contexts indicate that inappropriate risk allocation between public clients and contractors contributes significantly to cost overruns and time extensions (Ochieng et al., 2020). In many cases, risk transfer mechanisms in public contracts are not aligned with the technical and financial capacity of contractors, thereby undermining project outcomes.

In Uganda, the road sector plays a strategic role in facilitating agricultural commercialization, regional trade, and socio-economic development under Vision 2040 and successive National Development Plans. The national road network spans approximately 20,000 kilometers, of which slightly over 6,000 kilometers are paved (Ministry of Works and Transport, 2022). Despite substantial public investment in road construction and rehabilitation, performance challenges persist. The Auditor General (2023) reports that several public road projects have experienced time overruns exceeding 30 percent of the original contract duration, alongside significant cost

variations and quality deficiencies. Premature pavement failures, inadequate drainage systems, and structural defects have been observed in some projects shortly after completion.

These challenges are often attributed to delayed compensation for right of way, escalation of construction material prices, variations in rainfall patterns, contractor underperformance, and weaknesses in supervision and contract administration (Ministry of Works and Transport, 2022). While these factors are frequently documented, less attention has been given to the underlying contractual and institutional mechanisms through which risks are distributed among clients, consultants, and contractors, and how mitigation measures are operationalized during implementation.

Within the Elgon Region of Eastern Uganda, the risk environment is particularly complex. The region, comprising districts such as Mbale, Bududa, Sironko, and Manafwa, is characterized by mountainous terrain, fragile soils, steep gradients, and high annual rainfall ranging from approximately 1,200 to 1,800 millimeters (Uganda National Meteorological Authority, 2022). The area is prone to recurrent landslides and soil erosion, which have disrupted transport infrastructure and increased construction uncertainty. These environmental and geotechnical conditions elevate risks related to slope instability, drainage failure, construction delays, and cost escalation. Furthermore, local governments in the region face financial constraints and limited technical capacity, which may affect the structuring and management of construction contracts.

Although previous studies in Uganda have examined procurement compliance, contractor performance, quality assurance, and contract monitoring in road construction projects, limited empirical research has specifically focused on risk allocation mechanisms and the effectiveness of mitigation practices within public road construction contracts. Existing literature frequently treats risks as broad project management concerns without systematically analyzing which party bears specific risks, whether such allocation aligns with established best practice principles, and how mitigation strategies influence cost, time, and quality performance outcomes (Ochieng et al., 2020; El-Sayegh et al., 2022). Moreover, little context specific evidence exists for environmentally vulnerable regions such as Elgon, where climatic variability and geotechnical instability significantly heighten infrastructure risks.

The absence of empirical evidence on how risks are contractually allocated and practically mitigated in such high-risk environments limits the ability of policymakers, contracting authorities, and project managers to design resilient and performance-oriented road projects. Therefore, this study sought to assess risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda in order to address this gap and contribute context specific knowledge to infrastructure risk governance.

1.3 Statement of the Problem

Public road construction projects in Uganda continue to experience persistent performance challenges despite increased public investment and the existence of established procurement and contract management frameworks. Reports from the Auditor General (2023) indicate that several road projects have recorded cost overruns, significant time extensions beyond original contract periods, and quality defects shortly after completion. In some cases, projects required variation orders that substantially increased contract sums, while others exhibited premature pavement failures, drainage inefficiencies, and structural deterioration within a few years of commissioning. These performance issues undermine value for money, strain public resources, and compromise service delivery to communities.

Existing explanations for these challenges often emphasize contractor capacity limitations, procurement delays, and inadequate supervision (Ministry of Works and Transport, 2022). While these factors are relevant, they do not sufficiently interrogate how risks are allocated in construction contracts and whether such allocation aligns with the technical, financial, and institutional capacity of the parties involved. International best practice recommends that risks should be allocated to the party best able to manage them efficiently (Project Management Institute [PMI], 2021; Yescombe, 2018). However, in many public infrastructure contexts, risks such as price fluctuations, design errors, right of way delays, environmental uncertainties, and geotechnical instability may be inappropriately transferred or ambiguously assigned, leading to disputes, claims, and performance inefficiencies (El-Sayegh et al., 2022).

In the Elgon Region of Eastern Uganda, these concerns are further compounded by elevated environmental and geotechnical risks associated with mountainous terrain, high rainfall intensity,

soil instability, and recurrent landslides (Uganda National Meteorological Authority, 2022). These contextual conditions increase uncertainty in road construction projects and heighten the need for robust risk allocation and mitigation mechanisms. Nevertheless, there is limited empirical evidence on how risks are actually distributed among clients, consultants, and contractors in road construction contracts within the region, and whether mitigation practices are effectively implemented to address identified risks.

Although prior studies in Uganda have examined procurement compliance, contractor performance, and quality assurance in road projects, there remains a gap in context specific research focusing on risk allocation mechanisms and the effectiveness of mitigation strategies in public road construction contracts. The absence of such evidence limits the ability of policymakers, contracting authorities, and project managers to design risk responsive contracts and strengthen infrastructure resilience.

Therefore, this study sought to assess risk allocation and mitigation practices in public road construction projects in the Elgon Region in order to determine how these practices influence project performance and to generate evidence based recommendations for improving risk governance in Uganda's road sector.

1.4 Objectives of the Study

1.4.1 General Objective

To assess the effectiveness of risk allocation and risk mitigation practices in public road construction projects in the Elgon Region of Uganda.

1.4.2 Specific Objectives

1. To evaluate the effectiveness of risk allocation practices in public road construction projects in the Elgon Region of Uganda.
2. To examine the challenges affecting effective risk allocation in public road construction contracts in the Elgon Region of Uganda.
3. To assess the effectiveness of risk mitigation strategies implemented in public road construction projects in the Elgon Region of Uganda.

4. To identify the challenges hindering the effective implementation of risk mitigation strategies in public road construction projects in the Elgon Region of Uganda.
5. To propose recommendations for improving risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda.

1.4.3 Research Questions

1. How effective are current risk allocation practices in public road construction projects in the Elgon Region of Uganda?
2. What challenges affect the effective allocation of risks among stakeholders in public road construction contracts in the Elgon Region of Uganda?
3. How effective are the risk mitigation strategies implemented in public road construction projects in the Elgon Region of Uganda?
4. What challenges hinder the successful implementation of risk mitigation measures in public road construction projects in the Elgon Region of Uganda?
5. What measures can be proposed to improve risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda?

1.5 Significance of the Study

This study will contribute significantly to theory, policy, professional practice, and public sector governance in Uganda's infrastructure sector, particularly in the management of public road construction projects in the Elgon Region of Uganda.

At the theoretical level, the study will contribute to the growing body of knowledge on construction risk management in developing country contexts. While global literature provides principles on optimal risk allocation and mitigation, there remains limited context specific empirical evidence from Uganda, particularly from environmentally vulnerable regions. By generating primary data on the effectiveness and challenges of risk allocation and mitigation practices, this study will enrich scholarly discourse on infrastructure risk governance, contract management, and public sector project performance. It will also provide an empirical basis for refining theoretical assumptions regarding how contractual risk structures influence project outcomes in high uncertainty environments.

At the policy and regulatory level, the study will benefit key government institutions responsible for infrastructure development and oversight. These include the Ministry of Works and Transport, the Uganda National Roads Authority, district local governments in the Elgon Region, and the Public Procurement and Disposal of Public Assets Authority. The findings will provide evidence based insights into whether existing contract frameworks and procurement guidelines adequately allocate risks to competent parties and whether mitigation mechanisms are effective in practice. This may inform improvements in standard bidding documents, contract conditions, risk sharing clauses, and supervision frameworks. The study may also support policy reforms aimed at strengthening accountability, reducing contract disputes, and improving value for money in public road projects.

For implementing agencies and local governments in the Elgon Region of Uganda, including Mbale City and districts such as Bududa, Sironko, and Manafwa, the study will offer practical recommendations tailored to the environmental and institutional realities of the region. Given the high rainfall intensity, landslide risks, and challenging terrain, local authorities require context specific strategies to manage geotechnical and climate related risks effectively. The study will therefore provide guidance on strengthening project planning, supervision, and risk monitoring systems within decentralized infrastructure delivery structures.

For contractors, consulting engineers, quantity surveyors, and project managers involved in public road construction projects, the study will provide practical insights into how risk allocation practices affect project performance and dispute occurrence. By identifying common weaknesses in risk transfer mechanisms and mitigation implementation, the study will help industry practitioners adopt more balanced risk sharing arrangements and proactive mitigation strategies. This may contribute to improved collaboration between clients and contractors, reduced claims, and enhanced project delivery outcomes.

Financial stakeholders, including development partners, infrastructure financiers, and government budget authorities, will also benefit from the study. Improved understanding of how risks are allocated and mitigated can enhance financial planning, contingency budgeting, and investment appraisal processes. Strengthening risk governance in road construction projects may reduce fiscal

exposure, minimize cost overruns, and enhance the sustainability of public infrastructure investments.

Communities and road users in the Elgon Region of Uganda stand to benefit indirectly from the findings of this study. More effective risk allocation and mitigation practices can improve the durability, safety, and reliability of road infrastructure. This in turn enhances access to markets, health services, schools, and emergency response services, thereby supporting socio economic development and regional integration.

Finally, academically, the study will serve as a foundation for future research in public infrastructure management, construction risk governance, and contract performance in Uganda and similar developing country contexts. It will provide baseline data and methodological guidance for scholars interested in examining infrastructure resilience, climate risk integration, and institutional capacity in public works management.

Overall, the study is significant because it bridges the gap between theoretical risk management principles and practical realities in public road construction projects in the Elgon Region of Uganda, while generating actionable recommendations for multiple stakeholders across the infrastructure ecosystem.

1.6 Justification of the Study

Uganda has significantly increased public investment in transport infrastructure over the past decade as part of its broader development agenda. However, despite this investment, performance challenges persist in public road construction projects. The Auditor General (2023) reports recurring time overruns, cost variations, and quality deficiencies in several road projects across the country. Similar findings have been documented in broader infrastructure studies in developing countries, where weak risk management practices have been linked to budget overruns, contract disputes, and premature infrastructure deterioration (Flyvbjerg, 2023; World Bank, 2020). These persistent challenges indicate that increased funding alone does not guarantee improved infrastructure performance; rather, effective governance mechanisms, including robust risk allocation and mitigation systems, are essential.

Existing studies in Uganda have largely focused on procurement compliance, contractor performance, quality control mechanisms, and supervision practices. While these studies provide valuable insights, they often treat risks as secondary operational issues rather than central contractual and governance concerns. International literature emphasizes that inappropriate risk allocation is a major contributor to infrastructure underperformance, particularly when risks are transferred to parties without the technical or financial capacity to manage them effectively (Yescombe, 2018; El-Sayegh et al., 2022). The Project Management Institute (2021) further stresses that risk management effectiveness depends not only on identification but also on proper allocation and continuous mitigation throughout the project lifecycle.

In the African context, Ochieng et al. (2020) argue that infrastructure project failures are frequently associated with institutional weaknesses and poorly structured risk-sharing arrangements. In many public works contracts, risks such as price escalation, environmental uncertainty, delayed payments, and design deficiencies are inadequately defined or ambiguously allocated, resulting in adversarial relationships and claims. Yet, empirical evidence examining these dynamics in Uganda remains limited, particularly in sub-national and environmentally sensitive regions.

The Elgon Region of Uganda presents a particularly compelling case for examining risk allocation and mitigation practices. The region is characterized by mountainous terrain, fragile soils, and high rainfall intensity, which increase the likelihood of landslides, erosion, and geotechnical instability (Uganda National Meteorological Authority, 2022). Such environmental conditions elevate construction uncertainty and amplify the consequences of poorly allocated risks. Standardized contract provisions may not sufficiently account for these localized environmental complexities. Without context-specific evaluation of how risks are contractually assigned and practically mitigated in such environments, road projects remain vulnerable to avoidable delays, cost escalations, and structural failures.

Moreover, Uganda operates within constrained fiscal space, with growing demands on public infrastructure financing. According to the World Bank (2020), inefficient risk management in infrastructure projects contributes to resource wastage and undermines value for money. Given competing development priorities, improving risk allocation and mitigation practices is essential to ensure that limited public resources yield sustainable and durable infrastructure outcomes.

Strengthening risk governance mechanisms can reduce dispute incidence, minimize financial exposure, and enhance project resilience in the face of climatic and institutional uncertainties.

This study is therefore justified on theoretical, empirical, and policy grounds. Theoretically, it contributes to construction risk management literature by providing context-specific evidence from a developing country setting. Empirically, it addresses a clear research gap concerning the effectiveness and challenges of risk allocation and mitigation in public road construction projects in the Elgon Region of Uganda. From a policy perspective, the findings will inform improvements in contract structuring, procurement guidelines, and risk management frameworks within Uganda's road sector.

Given the increasing environmental risks associated with climate variability, the fiscal pressures on public infrastructure financing, and the need for improved accountability in public works delivery, this study is both timely and strategically relevant to Uganda's infrastructure development agenda.

1.7 Theoretical Framework

This study was anchored in Risk Management Theory and Contract Theory. These two complementary theoretical perspectives provide a structured lens for analyzing how risks are identified, allocated, mitigated, and governed within public road construction projects in the Elgon Region of Uganda, and how these processes influence project performance outcomes.

Risk Management Theory provides the foundational framework for understanding how uncertainty is systematically managed within projects. According to the Project Management Institute (2021), effective risk management involves structured processes of risk identification, qualitative and quantitative risk analysis, risk allocation, response planning, implementation of mitigation strategies, and continuous monitoring and control throughout the project lifecycle. The theory assumes that projects operate within uncertain environments and that proactive management of risks enhances the likelihood of achieving performance objectives related to cost, time, scope, and quality.

In construction projects, risks may be technical, financial, environmental, institutional, or contractual in nature. Risk Management Theory posits that the effectiveness of a project depends not merely on identifying risks but on allocating them appropriately and implementing suitable response strategies such as avoidance, reduction, transfer, or acceptance (Hillson & Simon, 2020). In high risk environments such as the Elgon Region of Uganda, where geotechnical instability and climatic variability increase uncertainty, systematic risk mitigation is essential for enhancing project resilience. Within this study, Risk Management Theory explains how structured mitigation strategies are expected to reduce cost overruns, delays, defects, and disputes in public road construction projects.

While Risk Management Theory explains the technical and managerial processes of handling uncertainty, Contract Theory provides a governance and incentive based perspective on how risks are distributed among stakeholders. Contract Theory, as advanced by Hart and Holmström (2017), examines how contractual arrangements shape incentives, responsibilities, and behavior among parties engaged in economic transactions. The theory recognizes that contracts are inherently incomplete due to uncertainty and information asymmetry. As a result, the allocation of risks within a contract influences the actions, effort levels, and decision making of the contracting parties.

In the context of public road construction projects, clients, consultants, and contractors operate under formal contractual agreements that define responsibilities and risk sharing mechanisms. Contract Theory suggests that risks should be allocated to the party best able to control or absorb them at least cost. However, when risks are misallocated, for example when contractors are required to bear risks beyond their technical or financial capacity, this may create moral hazard, opportunistic behavior, claims, renegotiations, and adversarial relationships (Yescombe, 2018). Conversely, overly retaining risks at the client level may reduce contractor incentives for efficiency and innovation. Therefore, the structure of risk allocation within road construction contracts has direct implications for performance outcomes.

The integration of Risk Management Theory and Contract Theory provides a comprehensive analytical framework for this study. Risk Management Theory explains how risks should be systematically identified and mitigated at the project management level, while Contract Theory

explains how risk allocation mechanisms embedded within contracts influence stakeholder incentives and behavior. Together, these theories suggest that effective risk allocation combined with well implemented mitigation strategies enhances project performance, reduces disputes, and improves value for money.

In the Elgon Region of Uganda, where environmental, institutional, and financial uncertainties are elevated, these theoretical perspectives are particularly relevant. The study therefore applies Risk Management Theory to assess the effectiveness of mitigation practices and applies Contract Theory to evaluate whether risk allocation mechanisms are aligned with stakeholder capacity and performance objectives. The combined framework enables the study to examine not only whether risks are managed, but also how contractual structures and institutional constraints shape the effectiveness of risk governance in public road construction projects.

1.8 Scope of the Study

The scope of this study was defined in terms of content, geographical coverage, and time frame. These boundaries are necessary to ensure clarity, feasibility, and analytical depth while maintaining alignment with the study objectives.

1.8.1 Content Scope

The study focused on the assessment of risk allocation and risk mitigation practices in public road construction projects in the Elgon Region of Uganda. Specifically, the content scope covered five key dimensions.

First, the study examined risk identification practices in public road construction projects. This will include the identification and categorization of major risks affecting road projects, such as technical risks, financial risks, environmental and geotechnical risks, contractual risks, institutional risks, and socio-political risks.

Second, the study analyzed risk allocation mechanisms embedded within public road construction contracts. This will involve examining how risks are distributed among key stakeholders, including the client or contracting authority, consultants, contractors, and where relevant, subcontractors.

Particular attention was given to contractual clauses, responsibility matrices, price adjustment provisions, force majeure clauses, and mechanisms for handling variations and claims.

Third, the study assessed the effectiveness of risk mitigation strategies implemented during project planning and execution. This included strategies such as contingency planning, insurance mechanisms, price adjustment formulas, geotechnical investigations, supervision and monitoring systems, performance securities, and environmental management measures.

Fourth, the study evaluated the challenges affecting both risk allocation and mitigation practices. These challenges may include institutional capacity constraints, funding delays, limited technical expertise, weak contract enforcement, political interference, and environmental uncertainties.

1.8.2 Geographical Scope

The study was conducted in the Elgon Region of Eastern Uganda. The region includes districts such as Mbale City, Bududa, Sironko, and Manafwa, among others. These districts have experienced significant public investment in road construction and rehabilitation in recent years.

The Elgon Region was selected due to its unique environmental and geotechnical characteristics. The mountainous terrain, steep gradients, fragile soils, and high rainfall intensity create heightened exposure to risks such as landslides, erosion, drainage failure, and slope instability. These contextual factors make the region particularly suitable for examining how risks are allocated and mitigated in high uncertainty environments.

The study will focus on selected public road construction projects implemented by central government agencies and district local governments within the region. These may include national roads, district roads, and urban roads funded through public budgets.

The findings will primarily apply to the Elgon Region; however, lessons drawn may have relevance for other environmentally vulnerable regions in Uganda with similar risk profiles.

1.8.3 Time Scope

The study focused on public road construction projects implemented between 2019 and 2024. This period has been selected for several reasons.

First, it captured recent road construction projects implemented under current procurement and contract management frameworks. Second, it reflects contemporary economic conditions, including fluctuations in construction material prices and fiscal pressures on public infrastructure financing. Third, the period includes years characterized by climatic variability and operational disruptions, which may have influenced risk allocation and mitigation practices.

By concentrating on this five-year period, the study generated current and policy-relevant insights into the effectiveness and challenges of risk allocation and mitigation in public road construction projects in the Elgon Region of Uganda.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature related to risk allocation and risk mitigation practices in infrastructure projects, particularly in public road construction. The purpose of the literature review is to provide a theoretical and empirical foundation for the study by examining how scholars and practitioners have conceptualized and analyzed risk management in construction projects. The chapter focuses on key themes relevant to the study objectives, including the effectiveness of risk allocation practices, the challenges affecting risk allocation, the effectiveness of risk mitigation strategies, and the challenges hindering the implementation of these strategies. The review draws from both global and regional studies on construction and infrastructure project management in order to highlight current knowledge, prevailing debates, and methodological approaches used in previous research. Particular attention is given to literature on road construction projects and other infrastructure sectors where risk management practices have been widely studied. The chapter also integrates studies from developing country contexts to provide insights relevant to infrastructure delivery environments similar to Uganda.

Through a critical evaluation of previous studies, the chapter identifies key gaps in the existing literature, especially regarding the effectiveness and implementation of risk allocation and mitigation strategies in public road construction projects. These gaps provide the justification for the present study, which seeks to assess risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda.

2.2 To evaluate the effectiveness of risk allocation practices in public road construction projects in the Elgon Region of Uganda

Recent literature shows that risk allocation is widely regarded as effective when risks are assigned to the party best able to control, absorb, or mitigate them at the lowest total cost, because such alignment reduces uncertainty, improves accountability, and supports better project outcomes in cost, time, quality, and dispute management. However, the same literature also shows that the practical effectiveness of risk allocation depends not only on what contracts state, but also on institutional capacity, procurement conditions, and implementation realities. This means that risk

allocation should be evaluated as an operational governance mechanism rather than merely a contractual formality

El-Sayegh et al. (2022) examined risk allocation in construction contracts and its impact on project performance and found that clearer and more appropriate allocation of risks is associated with better project performance. The study is important because it moves beyond abstract discussion of risk and directly links contractual risk allocation to performance outcomes. Its main strength lies in showing that when responsibility for uncertain events is clearly assigned, project actors are better positioned to respond effectively, thereby reducing disputes and inefficiencies. However, the study is limited by its broad construction focus, since it does not concentrate specifically on public road projects or on environmentally fragile settings such as mountainous regions. It also gives limited attention to whether parties actually possess the technical and financial capacity required to manage the risks assigned to them. As a result, while the study strongly supports the principle of proper allocation, it is less explicit on how such allocation performs in context-specific public road environments such as the Elgon Region of Uganda

Luo and Chen's 2024 study, published in 2025, deepens the governance perspective by examining how contractual governance affects construction project performance through contractor behaviour. The study argues that properly handling and responding to project risks is a primary function of contractual governance and suggests that contractual clarity can improve performance by shaping contractor conduct. This is particularly useful for this study because it implies that risk allocation is effective not only when it distributes responsibility, but also when it creates behavioural incentives for compliance, responsiveness, and cooperation. The major strength of the study is that it introduces a behavioural mechanism between contract structure and project performance, which many earlier studies overlooked. Its limitation, however, is that it addresses construction projects broadly rather than isolating public road works or public-sector contracting in developing countries. It therefore provides strong theoretical support for studying effectiveness, but less direct evidence on road-specific public contracts under African institutional conditions

Lee et al. (2024) analyzed 170 road construction projects and found that construction cost growth varied significantly with bid award rate, contract method, road length, and cost composition, with average cost growth reported at 20.22 percent. The study is highly relevant because it focuses

specifically on road construction and demonstrates that procurement and contract conditions materially shape project cost outcomes. One of its major contributions is showing that projects with very low bid award rates experienced significantly higher cost growth, suggesting that aggressive tender conditions may embed unrealistic risk transfer to contractors. This makes the study valuable for understanding how ineffective allocation may be disguised within procurement structures. Its weakness is that it focuses more on cost growth patterns than on explicit legal or contractual risk ownership, so it offers indirect rather than direct evidence on allocation mechanisms. Even so, it provides strong empirical support for the argument that contractual arrangements influence whether risk allocation is ultimately effective in road projects

Zhasmukhambetova et al. (2025) conducted a systematic literature review of 83 peer-reviewed studies on highway construction and identified recurrent drivers of time and cost underperformance, including financial constraints, regulatory and political issues, land acquisition delays, design changes, utility conflicts, contractor-related issues, material shortages, labour issues, weather conditions, and weak planning. The study is particularly useful because it synthesizes global highway evidence and clarifies the dominant risks that should be considered in allocation frameworks. Its main strength is breadth, since it brings together findings across multiple geographic contexts and provides a consolidated view of the most critical highway risks. The study is nevertheless limited by the fact that, as a systematic review, it does not test the effectiveness of specific allocation models in a single empirical setting. It identifies what risks matter most, but it does not sufficiently explain how public clients, consultants, and contractors should distribute them in practice. For the present study, this creates an opening to examine not just what risks exist in road projects, but whether current allocation practices in the Elgon Region are actually effective against those known risks

Machira and Kising'u (2024) examined risk management practices and performance of road construction projects in Kilifi County, Kenya, using a correlational cross-sectional survey. They found that risk identification and risk analysis had positive and significant relationships with project performance. The study is relevant because it provides road-sector evidence from East Africa and confirms that formal treatment of project risks is associated with better outcomes. Its strength lies in its road-specific focus and in demonstrating empirically that structured risk processes matter in public road implementation. However, the study concentrates mainly on risk

identification and analysis rather than on the allocation of risks among contracting parties. In other words, it is stronger on pre-allocation management processes than on the actual issue of who should bear what risk. This limits its usefulness for answering allocation questions directly, though it still supports the broader claim that risk governance quality affects road project performance

Byomugabe (2024) assessed whether procurement risk planning could deliver better outcomes for road construction projects in Kampala City, Uganda. The study is important because it offers Uganda-specific evidence and shows that early-stage procurement risk planning can improve project outcomes. Its strength is contextual relevance, since it deals with the Ugandan road sector rather than relying solely on foreign evidence. It also highlights that risk allocation effectiveness begins before implementation, particularly during bid preparation, procurement design, and contractual planning. However, the study appears to focus more on procurement risk planning as an administrative process than on evaluating whether specific risks are ultimately assigned to the most capable party. This means it contributes to the pre-contract side of the discussion, but leaves a gap regarding actual allocation effectiveness during implementation. It is therefore useful but incomplete for understanding the full contractual and operational dimensions of risk allocation in public road projects

Mwaiseje et al. (2024) investigated procurement contract risk management and the performance of force account construction projects. The study is relevant because force account projects are common in public-sector infrastructure delivery, and procurement contract risk management is closely related to how risks are shared and controlled. Its strength lies in demonstrating that contract risk management influences performance, thereby reinforcing the importance of structured contractual treatment of uncertainty. Another important contribution is that it broadens the discussion from conventional contractor-executed projects to force account arrangements, which are often underexplored in infrastructure research. The limitation, however, is that the study centers on procurement contract risk management generally and not specifically on detailed allocation effectiveness across different stakeholders. It also appears to address construction projects beyond only public roads, which slightly weakens its sector specificity for the present study

Jackson et al. (2024) identified and classified 43 construction risk factors affecting projects in Ghana and developed a confirmatory factor model to understand those risks. The study is valuable because it adds a rigorous analytical structure to the identification and classification of construction risks, which is important for subsequent allocation. Its key strength is methodological, since it uses structural equation modeling to organize critical risk variables in a way that can support better management decisions. However, the study is more concerned with identifying and modeling risks than with evaluating whether risk ownership is assigned effectively in contracts. It therefore contributes more strongly to the front-end knowledge base needed for allocation than to the assessment of allocation effectiveness itself. For this reason, it is helpful but not sufficient on its own for evaluating public road contract practice in Uganda

Dikmen et al. (2025) developed models for automating the review of construction contracts to extract information on risk and responsibility using natural language processing and machine learning. The study is highly innovative because it recognizes that construction contracts contain critical risk-related information that often cannot be reviewed comprehensively under normal bidding time constraints. Its major strength is practical and methodological: it shows that technology can help reveal hidden or ambiguous distributions of responsibility within complex contract documents. This is useful for studies of risk allocation because ineffective allocation may sometimes stem from poor visibility, inconsistency, or interpretive difficulty in contract clauses. The limitation is that the study focuses on contract analysis technology rather than on real-world public road outcomes. It therefore helps identify contractual risk distribution more efficiently, but does not itself prove which allocation models are most effective in Uganda's road sector

Saad et al. (2025) proposed and validated a risk mitigation model for addressing contractual claims risk in civil infrastructure projects in South Africa using data from 166 industry professionals. Although the study emphasizes mitigation rather than allocation, it remains important because claims often arise when risks are poorly assigned, misunderstood, or insufficiently managed. Its strength lies in linking contractual risk issues to practical mitigation responses within civil infrastructure, making it highly relevant to public works environments. The study also has regional relevance because it comes from an African infrastructure context rather than a high-income setting. Its limitation is that it concentrates on claims risk and mitigation models rather than on the prior question of whether initial allocation was appropriate. Even so, it supports the argument that

ineffective allocation has downstream consequences that must later be managed through mitigation and dispute reduction mechanisms

Uganda-specific gray literature also points to the continued importance of contract and risk-related practices in road performance. For example, Banyenzaki's Uganda study on road construction performance in Wakiso District reported that project performance was strongly associated with resources, funding, political influence, manpower, and design-related issues. The value of this study lies in its local relevance and its recognition that risk-related factors materially affect road performance. Its weakness, however, is that it is an older district-level study and is not centered specifically on contractual risk allocation. It therefore provides useful contextual background on the kinds of factors that impair road delivery in Uganda, but does not directly evaluate whether those risks were allocated effectively among contracting actors

Taken together, the reviewed literature suggests that effective risk allocation improves project outcomes by clarifying responsibility, strengthening incentives, reducing ambiguity, and supporting more realistic pricing and decision making. The literature also shows that effectiveness is not determined by the mere existence of risk clauses, but by whether dominant project risks are allocated to actors with the capacity and authority to manage them, and whether procurement and implementation systems support that allocation in practice. At the same time, much of the available evidence either addresses construction projects broadly, emphasizes general risk management rather than allocation, or examines procurement and performance without fully unpacking who bears which risks and with what consequences. This gap is especially clear in Uganda and even more so in environmentally vulnerable public road settings such as the Elgon Region, where geotechnical instability, rainfall variability, funding constraints, and institutional weaknesses may significantly affect the real effectiveness of risk allocation practices

2.3 To examine the challenges affecting effective risk allocation in public road construction contracts in the Elgon Region of Uganda

Although the literature widely acknowledges the importance of risk allocation in improving infrastructure project performance, several studies reveal that the effectiveness of risk allocation mechanisms is often undermined by practical implementation challenges. Risk allocation is theoretically based on the principle that risks should be assigned to the party best able to manage them efficiently and at the lowest cost. However, empirical evidence indicates that this principle is rarely applied consistently in real-world construction environments (; Project Management Institute, 2021; El-Sayegh et al., 2022). As a result, infrastructure projects frequently experience cost overruns, delays, disputes, and performance inefficiencies due to poorly structured or inadequately implemented risk allocation arrangements (Flyvbjerg, 2021; Ochieng et al., 2020; Zhasmukhambetova et al., 2025). Despite this recognition, much of the literature remains descriptive and provides limited empirical evaluation of how effectively risk allocation actually operates in specific infrastructure contexts.

One of the major challenges highlighted in the literature is the presence of ambiguity in construction contracts. El-Sayegh et al. (2022) argue that unclear contractual clauses regarding responsibility for risks often result in disputes between contractors and clients during project implementation. When responsibilities for events such as design changes, material price escalation, or unforeseen site conditions are not clearly defined, project stakeholders may interpret contractual obligations differently, leading to adversarial relationships and costly claims. Luo and Chen (2025) similarly suggest that contractual governance plays a critical role in shaping contractor behaviour, and weak or ambiguous contractual provisions may undermine effective risk response. While these studies provide useful insights into the relationship between contract clarity and project performance, they mainly focus on construction projects broadly rather than specifically examining public road projects. Moreover, they tend to emphasize theoretical governance mechanisms without sufficiently evaluating how such contractual arrangements function in public-sector infrastructure systems in developing countries. Consequently, there remains limited empirical understanding of how contract ambiguity affects risk allocation effectiveness in public road construction projects in regions such as Eastern Uganda.

Another challenge identified in the literature relates to the imbalance of bargaining power between contracting parties. According to Ochieng et al. (2020), in many developing countries public clients often transfer substantial risks to contractors through contractual provisions without adequately considering whether contractors have the capacity to manage those risks effectively. This practice is frequently driven by attempts to minimize government financial exposure. Lee et al. (2024) provide empirical evidence from road construction projects showing that procurement conditions such as extremely low bid award rates are associated with higher cost growth, suggesting that excessive risk transfer during procurement may undermine project performance. Although these studies demonstrate that imbalanced risk allocation can distort project outcomes, they do not adequately examine the institutional and regulatory mechanisms that enable or constrain balanced risk sharing in public infrastructure projects. In addition, the studies are largely conducted outside the Ugandan context, which limits their direct applicability to the specific institutional environment of the Elgon Region.

Institutional capacity limitations represent another critical challenge affecting the effectiveness of risk allocation in infrastructure projects. Ochieng et al. (2020) observe that many public infrastructure agencies in Sub-Saharan Africa face shortages of skilled personnel capable of conducting detailed risk assessments and managing complex construction contracts. Jackson et al. (2024) similarly found that construction risk management effectiveness depends heavily on the technical competence of project managers and engineers responsible for risk identification and response planning. While these studies highlight the importance of institutional capacity in managing project risks, they tend to focus primarily on general risk management practices rather than the specific process of allocating risks among contractual stakeholders. Furthermore, most of the existing studies examine national-level infrastructure systems rather than localized regional contexts where institutional capacity constraints may be more pronounced. This creates a gap in the literature regarding how institutional capacity affects the practical implementation of risk allocation practices in decentralized infrastructure environments such as district-level road projects.

Financial constraints and procurement pressures are also widely reported as barriers to effective risk allocation. The World Bank (2020) notes that infrastructure projects in developing economies often operate under severe fiscal limitations, which encourages procurement strategies that

prioritize cost minimization over balanced risk distribution. Flyvbjerg (2021) argues that such pressures frequently result in optimism bias and unrealistic cost estimates, leading to cost overruns and schedule delays during project implementation. Lee et al. (2024) further show that aggressive bidding practices may lead contractors to underestimate risks in order to secure contracts, only for these risks to emerge later as claims or contract variations. Although these studies demonstrate how procurement strategies can distort risk allocation outcomes, they provide limited analysis of how procurement policies can be redesigned to promote more effective risk sharing. Moreover, most studies treat procurement conditions and risk allocation as separate issues rather than examining their interaction within public road construction contracts.

Environmental and geotechnical uncertainties present another major challenge in the allocation of risks in road construction projects. Zhasmukhambetova et al. (2025) identify environmental conditions such as extreme weather, soil instability, and flooding as some of the most critical risks affecting highway construction projects globally. These risks are particularly difficult to allocate effectively because they are influenced by natural processes that cannot be fully controlled by any single contracting party. The World Bank (2020) also emphasizes that climate variability is increasing the vulnerability of road infrastructure in many developing countries. While these studies highlight the importance of environmental risks in infrastructure delivery, they generally examine such risks at a macro level and do not explore how environmental uncertainty affects the contractual distribution of responsibilities among project stakeholders. This is particularly important in mountainous and landslide-prone regions such as the Elgon Region of Uganda, where environmental conditions significantly influence construction feasibility and risk exposure.

Another challenge identified in the literature is the limited integration of contractual risk allocation with operational risk management processes during project implementation. Hillson and Simon (2020) argue that risk allocation provisions in contracts often remain largely static documents that are rarely revisited once construction begins. Similarly, Machira and Kising'u (2024) found that while risk identification and analysis positively influence road construction project performance, many projects fail to maintain continuous risk monitoring throughout implementation. This disconnect between contractual risk allocation and ongoing project risk management reduces the effectiveness of both mechanisms. However, most studies examining this issue focus on general

risk management practices rather than specifically evaluating how contractual risk allocation mechanisms interact with project management processes.

Studies conducted in Uganda also provide useful insights but reveal significant limitations. For example, Byomugabe (2024) found that procurement risk planning can improve the performance of road construction projects in Kampala. While this study contributes valuable Uganda-specific evidence, it focuses primarily on procurement planning rather than examining how risks are ultimately allocated and managed within construction contracts. Similarly, studies on road construction performance in Uganda often emphasize factors such as funding delays, political influence, and contractor capacity (Auditor General, 2023; Ministry of Works and Transport, 2022). Although these factors are important, they do not provide detailed analysis of how contractual risk allocation affects project performance outcomes.

Overall, the literature demonstrates that several challenges hinder the effective allocation of risks in infrastructure projects, including contract ambiguity, imbalance of bargaining power, institutional capacity constraints, procurement pressures, environmental uncertainties, and weak integration between contractual and operational risk management systems. However, existing studies reveal several important research gaps. First, much of the literature focuses on construction projects broadly rather than specifically examining public road construction projects. Second, many studies emphasize risk identification and management processes but pay limited attention to the effectiveness of contractual risk allocation itself. Third, there is limited empirical evidence from the Ugandan context, particularly at regional levels where environmental and institutional conditions may differ significantly from national averages. Finally, few studies examine how risk allocation practices function in environmentally vulnerable regions such as the Elgon Region of Uganda, where geotechnical and climatic risks are particularly significant.

These gaps highlight the need for context-specific research that evaluates how risks are actually allocated and mitigated in public road construction projects and how these practices influence project outcomes. By examining risk allocation and mitigation practices in road construction projects in the Elgon Region of Uganda, this study seeks to address these gaps and contribute empirical evidence to improve infrastructure risk governance in developing country contexts.

2.4 To assess the effectiveness of risk mitigation strategies implemented in public road construction projects in the Elgon Region of Uganda

Risk mitigation strategies play a central role in managing uncertainty in infrastructure projects, particularly in complex sectors such as road construction. Risk mitigation refers to the set of actions taken to reduce the probability of risk occurrence or minimize the impact of risks on project objectives such as cost, time, and quality (Project Management Institute, 2021; Hillson & Simon, 2020). In infrastructure projects, these strategies may include contingency planning, insurance mechanisms, geotechnical investigations, supervision and monitoring systems, financial hedging, contract variations, and environmental protection measures (Yescombe, 2018; El-Sayegh et al., 2022). Although risk mitigation is widely recognized as essential for project success, several studies indicate that the effectiveness of these strategies varies significantly across projects and institutional contexts (Flyvbjerg, 2021; Zhasmukhambetova et al., 2025).

One stream of literature suggests that systematic risk mitigation significantly improves infrastructure project performance. Machira and Kising'u (2024) examined risk management practices and performance of road construction projects in Kenya and found that projects that actively implemented risk identification, analysis, and mitigation strategies performed better in terms of schedule adherence and cost control. The study demonstrates that structured mitigation processes can enhance project outcomes when implemented effectively. However, the study largely focuses on general risk management practices and does not examine in detail how specific mitigation strategies are operationalized during project implementation. Furthermore, the study is based on survey data and therefore provides limited insight into how mitigation strategies function in complex contractual environments.

Similarly, Jackson et al. (2024) identified and classified construction risks affecting infrastructure projects in Ghana and highlighted the importance of proactive mitigation strategies such as resource planning, conflict resolution mechanisms, and effective supervision. Their findings suggest that early mitigation actions reduce the likelihood of disruptions during project execution. While the study contributes to understanding the importance of proactive mitigation, it primarily focuses on identifying risk factors rather than assessing the practical effectiveness of mitigation strategies in reducing project disruptions. In addition, the study examines construction projects

broadly rather than focusing specifically on road infrastructure projects, which often face unique environmental and geotechnical challenges.

Research conducted in global highway construction contexts also emphasizes the importance of mitigation strategies in improving project outcomes. Zhasmukhambetova et al. (2025), in a systematic review of highway construction risks, identified mitigation strategies such as improved planning, early stakeholder engagement, enhanced supervision, and adoption of contingency funding mechanisms as critical in addressing time and cost overruns. The strength of this study lies in its synthesis of a large body of global literature, which provides a comprehensive overview of mitigation strategies used in highway construction. However, the study does not evaluate how effective these strategies are within specific institutional environments. In particular, the review does not assess how contextual factors such as governance capacity, procurement frameworks, and environmental conditions influence the effectiveness of mitigation strategies in practice.

Another important perspective in the literature focuses on mitigation strategies designed to address contractual claims and disputes. Saad et al. (2025) developed a risk mitigation model for addressing contractual claims risk in civil infrastructure projects in South Africa. Their findings suggest that structured mitigation strategies such as clear communication channels, early dispute resolution mechanisms, and proactive contract management significantly reduce the occurrence of contractual claims. The study is valuable because it links mitigation strategies directly to dispute management in infrastructure projects. However, its focus on claims management means that it addresses only one dimension of project risk, leaving other forms of risk such as environmental, financial, and technical risks less explored.

Technological innovations have also been proposed as tools for improving risk mitigation effectiveness in construction projects. Dikmen et al. (2025) demonstrate that digital technologies such as machine learning and natural language processing can be used to analyze construction contracts and identify risk-related clauses more effectively. By improving transparency in contract interpretation, such technologies may enhance the ability of project stakeholders to implement appropriate mitigation strategies. Although the study introduces a valuable methodological advancement, it focuses mainly on contract analysis rather than evaluating whether mitigation strategies derived from such analysis actually improve project outcomes.

In the broader infrastructure literature, scholars argue that mitigation strategies are most effective when integrated into project planning and monitoring processes. Hillson and Simon (2020) emphasize that mitigation measures should not be treated as isolated actions but as part of a continuous risk management cycle that includes monitoring, review, and adjustment. Similarly, the Project Management Institute (2021) highlights that effective risk mitigation requires ongoing assessment of emerging risks throughout the project lifecycle. While these theoretical frameworks provide strong guidance on best practices, empirical studies often reveal a gap between theory and practice. In many infrastructure projects, mitigation strategies are developed during planning stages but are not consistently implemented during project execution.

Studies in developing country contexts further highlight institutional challenges affecting the effectiveness of mitigation strategies. Ochieng et al. (2020) observe that infrastructure projects in Sub-Saharan Africa often struggle with weak supervision systems, delayed funding, and inadequate technical capacity, which undermine the implementation of mitigation measures. These challenges are compounded by limited monitoring and evaluation systems that fail to track the effectiveness of mitigation strategies over time. As a result, mitigation plans may exist in project documents but may not be fully implemented in practice.

In the Ugandan context, infrastructure performance reports indicate that several road construction projects experience delays and cost variations due to factors such as delayed compensation for right-of-way, fluctuations in construction material prices, and weather-related disruptions (Auditor General, 2023; Ministry of Works and Transport, 2022). Although mitigation strategies such as contingency budgeting and supervision mechanisms are often incorporated in project planning documents, their practical effectiveness in addressing these challenges remains unclear. Existing studies in Uganda tend to focus on procurement processes, contractor capacity, or project financing rather than evaluating whether risk mitigation strategies effectively reduce project uncertainties.

Environmental conditions also play a significant role in determining the effectiveness of mitigation strategies in road construction projects. According to the Uganda National Meteorological Authority (2022), regions such as the Elgon Region experience high rainfall intensity and frequent landslides, which increase construction risks related to slope instability, erosion, and drainage failure. Although mitigation strategies such as improved drainage design and slope stabilization

techniques are often recommended in such contexts, there is limited empirical evidence on whether these strategies are effectively implemented in road construction projects in the region.

Overall, the literature suggests that risk mitigation strategies are essential for improving infrastructure project performance, but their effectiveness is often constrained by institutional, financial, environmental, and technical factors. Many studies emphasize the importance of mitigation strategies but provide limited empirical evaluation of how these strategies perform in practice. Furthermore, much of the available literature focuses on construction projects generally rather than specifically examining public road construction projects. There is also limited research examining the effectiveness of mitigation strategies in developing country contexts, particularly in environmentally vulnerable regions where infrastructure risks are heightened.

These limitations reveal several research gaps. First, existing studies rarely evaluate the actual effectiveness of mitigation strategies in reducing cost overruns, delays, and quality defects in public road construction projects. Second, there is limited empirical evidence from the Ugandan context regarding how mitigation strategies are implemented during road construction projects. Third, few studies examine how environmental risks associated with mountainous and landslide-prone regions influence the effectiveness of mitigation strategies. By assessing the effectiveness of risk mitigation strategies implemented in public road construction projects in the Elgon Region of Uganda, this study seeks to address these gaps and provide context-specific insights that can inform infrastructure risk management practices.

2.5 To identify the challenges hindering the effective implementation of risk mitigation strategies in public road construction projects in the Elgon Region of Uganda

Although the literature generally agrees that risk mitigation is essential for improving infrastructure project performance, evidence increasingly shows that the implementation of mitigation strategies is often much weaker than their formal design. In many construction and transport projects, mitigation measures are documented at appraisal, design, or contract stages, yet they are not translated consistently into day-to-day project control, supervision, and decision-making during execution. This means that the challenge in many public road projects is not simply the absence of mitigation plans, but the weak institutional and operational capacity to implement them effectively in practice. This concern is visible across recent studies on highway risks, public-sector risk management, and infrastructure delivery systems (Project Management Institute, 2021; Hillson & Simon, 2020; Zhasmukhambetova et al., 2025; Sikhupelo, 2025).

One of the most persistent challenges identified in the literature is weak prioritization and operational follow-through. Zhasmukhambetova et al. (2025), in a systematic review of highway construction risks, show that road projects are repeatedly affected by financial, regulatory, political, land acquisition, design change, material supply, contractor, labour, and weather-related risks. The study is valuable because it synthesizes risk evidence across highway projects and demonstrates the breadth of threats that mitigation systems are expected to address. However, its main limitation is that it identifies critical risks more strongly than it explains why mitigation measures often fail during implementation. In other words, the review is strong on what should be mitigated, but less explicit on the organizational and contractual barriers that prevent actual mitigation from happening. This creates an important gap for studies that want to move beyond risk identification and examine why mitigation is not effectively executed in live public road projects (Zhasmukhambetova et al., 2025).

A related challenge is the failure to quantify risks and tie mitigation actions to measurable performance thresholds. Senić et al. (2024) developed risk quantification models for road infrastructure projects and showed that delays and cost overruns can be linked to specific risk clusters and modeled more systematically. The study is useful because it moves mitigation from a generic managerial concept to a more evidence-based and prioritised approach. Its key contribution

is the argument that mitigation becomes more effective when risks are ranked and funding or preventive effort is matched to the highest-impact exposures. However, the study also indirectly reveals a practical weakness in many road projects, namely that mitigation often remains too general and insufficiently quantified. Its limitation is that it focuses on modeling and quantification rather than on the institutional realities that determine whether project teams actually use such tools in public-sector settings. Thus, while the study helps show what effective mitigation should look like, it leaves unresolved the question of why public agencies and contractors often fail to adopt such structured approaches during implementation (Senić et al., 2024).

Recent work by Senić et al. (2025) further strengthens this argument by proposing a multi-criteria approach to road-project risk mitigation. The study is analytically strong because it integrates expert judgement and systematic evaluation to improve mitigation decision-making in road infrastructure. It suggests that mitigation can be made more effective when competing risks are comparatively assessed rather than treated in isolation. However, the practical weakness of this kind of study is that it assumes the availability of data, technical competence, and decision discipline, conditions that are often limited in public road agencies in developing countries. As a result, the study is valuable as a methodological ideal, but it does not fully address the implementation barriers that arise in low-capacity, resource-constrained environments such as decentralized public works systems. This again points to a research gap between technically sound mitigation frameworks and their practical implementation in contexts like Uganda's road sector (Senić et al., 2025).

Another challenge repeatedly emphasized in the literature is weak institutional capacity. Sikhupelo (2025), in a study on barriers to implementing risk management practices in public institutions, found that insufficient skills, weak leadership support, and limited organizational commitment hinder the implementation of risk management systems. Although the study is not road-sector specific, it is highly relevant because public road construction projects are also implemented within bureaucratic systems where mitigation depends on managerial competence, enforcement, and institutional ownership. Its strength lies in highlighting that mitigation failure is often an administrative and organizational problem, not merely a technical one. Its limitation, however, is that it focuses on public-sector risk management generally and does not isolate road construction or infrastructure delivery. Even so, the study is valuable because it helps explain why mitigation

measures that appear adequate on paper may fail in practice when institutions lack trained personnel, coordination systems, and implementation discipline (Sikhupelo, 2025).

Financial constraints and weak budget flexibility also hinder mitigation implementation. The African Development Bank (2021) notes that Africa continues to face a major infrastructure financing gap, while the World Bank has repeatedly pointed to funding constraints as a driver of implementation delays and weak project control in infrastructure delivery. In practical terms, mitigation strategies such as geotechnical investigations, slope stabilization, drainage redesign, contingency financing, utility relocation, and stronger supervision all require upfront resources. When projects are procured under tight budgets or when governments release funds late, mitigation actions are often postponed, reduced, or implemented reactively rather than proactively. The literature therefore suggests that mitigation failure is frequently linked to fiscal and budget management weaknesses, not simply to poor technical planning (African Development Bank, 2021; World Bank, 2024).

Procurement and contract-management weaknesses are another major barrier. A recent World Bank synthesis on drivers of delays in infrastructure procurement identifies weak project and contract management, changes in project design or scope, and funding constraints as leading causes of delay. This is important because many mitigation strategies in road projects depend on timely procurement decisions, design finalization, and responsive contract administration. The strength of this evidence is that it connects implementation problems to the broader project cycle rather than treating mitigation as a standalone activity. Its limitation is that the analysis addresses infrastructure projects generally and does not fully unpack how these delays specifically undermine mitigation actions in road construction. Still, it strongly implies that even well-designed mitigation strategies are unlikely to succeed where procurement systems are slow, designs keep changing, and contract managers are unable to act promptly (World Bank, 2024).

Another important challenge concerns the complexity and uncertainty of local infrastructure environments. A recent Emerald study on local infrastructure challenges shows that infrastructure projects often face multiple operational obstacles that complicate implementation, including coordination difficulties, resource limitations, and local delivery constraints. The study is useful because it underscores that mitigation strategies are not implemented in a vacuum; they operate

within politically and administratively complex environments. However, the study is broader than road construction and not centered specifically on mitigation systems. Its value for the present topic is therefore interpretive rather than direct. Even so, it supports the argument that mitigation measures may fail not because they are conceptually weak, but because local delivery systems are fragmented and under-resourced (Emerald, 2026 study on local infrastructure challenges).

Environmental uncertainty is another major implementation barrier, especially in road projects. Kahangirwe et al. (2024) show that road infrastructure projects in Sub-Saharan Africa generate significant social impacts and often encounter context-sensitive implementation challenges. Although the study focuses on social impacts rather than mitigation alone, it is useful in showing that road projects operate in settings where community issues, land access, livelihood effects, and environmental disruption complicate project delivery. The limitation is that the study is broader than risk mitigation practice and does not directly test the effectiveness of mitigation measures. Nevertheless, it demonstrates that mitigation in road construction is not only a technical issue but also a social and governance issue, which is especially relevant where road projects trigger resettlement concerns, local resistance, or delayed site access (Kahangirwe et al., 2024).

Climate and terrain-related risks create additional implementation challenges in road projects, particularly in Sub-Saharan Africa. A recent study by Mensha (2024), perspective on road development in Sub-Saharan Africa highlights the complex tradeoffs and contextual challenges associated with road expansion, including environmental pressures and governance difficulties. This line of evidence matters because mitigation strategies for roads in fragile landscapes require specialized design responses, monitoring, and maintenance discipline. The literature therefore suggests that mitigation is especially difficult in terrains exposed to erosion, flooding, and slope failure, since such environments demand continuous adaptation rather than one-time technical fixes. However, broader regional studies often discuss these issues at a macro level and do not examine how project teams on specific road contracts operationalize mitigation under such conditions. This leaves a clear empirical gap for location-specific studies such as one focused on the Elgon Region of Uganda, where rainfall intensity, fragile soils, and landslide exposure likely complicate mitigation implementation (Biber-Freudenberger et al., 2025; Uganda National Meteorological Authority, 2022).

Uganda-specific project documentation also points to weaknesses in mitigation implementation. A recent World Bank review of Uganda city and municipality infrastructure programming noted that while risks and mitigation measures were identified, the analysis would have been strengthened by clearer prioritization, explicit performance indicators, and deeper technical discussion of expected mitigation effectiveness. This is significant because it suggests that even where risks are acknowledged in Ugandan infrastructure programming, mitigation design may remain too general and insufficiently tied to measurable implementation benchmarks. The strength of this evidence is its direct relevance to Uganda. Its limitation is that it concerns urban infrastructure programming more broadly rather than only road construction projects. Still, it reveals a recurring implementation problem: mitigation plans may be present, but they are not always operationalized through strong prioritization, performance measurement, and technical follow-through (World Bank, 2026 Uganda cities and municipalities infrastructure review).

Uganda-specific transport project documents also reveal concrete implementation constraints. For example, World Bank implementation reporting on a major Uganda road corridor project noted delays in starting some components and subsequent restructuring due to insufficient time to complete works within the original project framework. This type of evidence is important because it shows how mitigation strategies can be undermined by time overruns, sequencing problems, and institutional delays in execution. The limitation is that such project reports are not designed as academic studies of mitigation effectiveness. Nevertheless, they provide grounded evidence that implementation challenges in Uganda's road sector are not hypothetical but already visible in actual public road operations (World Bank, 2024 Uganda road project implementation reporting).

Overall, the literature suggests that the main challenges hindering effective implementation of risk mitigation strategies in public road construction projects include weak prioritization of risks, limited quantification of mitigation needs, insufficient institutional capacity, funding constraints, procurement and contract-management delays, environmental complexity, and weak performance monitoring. The literature is useful in identifying these barriers, but it also reveals several important gaps. First, many studies focus on risk management in general rather than on the implementation of mitigation strategies in road construction specifically. Second, road-specific studies often identify critical risks but stop short of evaluating why mitigation measures fail during execution. Third, much of the available evidence is either global, methodological, or non-Ugandan,

leaving limited context-specific empirical evidence from Uganda's public road sector. Fourth, very little literature examines these challenges in environmentally fragile regions such as the Elgon Region, where landslides, erosion, rainfall variability, and decentralized institutional capacity are likely to make mitigation implementation particularly difficult. These gaps justify the need for a focused study on the challenges hindering effective implementation of risk mitigation strategies in public road construction projects in the Elgon Region of Uganda (Zhasmukhambetova et al., 2025; Senić et al., 2024; Sikhupelo, 2025; World Bank, 2024).

2.6 Summary of the Literature Review and Identified Research Gaps

The reviewed literature demonstrates that risk allocation and risk mitigation are widely recognized as critical components of effective infrastructure project management. Studies across construction and infrastructure sectors consistently show that when risks are properly identified, allocated to the most capable party, and supported by appropriate mitigation strategies, projects are more likely to achieve better outcomes in terms of cost control, schedule performance, quality standards, and dispute reduction (Project Management Institute, 2021; El-Sayegh et al., 2022; Hillson & Simon, 2020). In road construction projects specifically, researchers have identified several categories of risks, including financial risks, design and technical risks, environmental and geotechnical risks, procurement-related risks, and institutional risks that significantly influence project implementation and performance (Zhasmukhambetova et al., 2025; Lee et al., 2024).

The literature further indicates that effective risk allocation depends on clear contractual arrangements, balanced distribution of responsibilities among project stakeholders, and adequate institutional capacity to manage risks throughout the project lifecycle (Yescombe, 2018; Ochieng et al., 2020). Similarly, risk mitigation strategies such as contingency planning, supervision mechanisms, financial safeguards, and proactive contract management are shown to improve project resilience and reduce uncertainties during implementation (Machira & Kising'u, 2024; Saad et al., 2025). However, the effectiveness of these strategies is often constrained by institutional weaknesses, procurement pressures, funding limitations, environmental uncertainties, and weak integration between contractual provisions and operational risk management practices (Flyvbjerg, 2021; Jackson et al., 2024).

Despite the valuable contributions of existing studies, several important gaps remain in the literature. First, many studies examine risk management practices in construction projects generally, with limited focus on public road construction projects, which face unique technical and environmental challenges. Second, a large proportion of the literature emphasizes risk identification and classification rather than evaluating the effectiveness of risk allocation and mitigation strategies in improving project outcomes. Third, much of the available empirical evidence originates from developed countries or other regions, leaving limited context-specific research from Sub-Saharan Africa and particularly from Uganda. Fourth, few studies investigate the challenges affecting the implementation of risk mitigation strategies in real project environments, especially within decentralized infrastructure systems. Finally, there is very limited research examining risk allocation and mitigation practices in environmentally vulnerable regions such as the Elgon Region of Uganda, where mountainous terrain, high rainfall intensity, and landslide risks significantly increase infrastructure uncertainties.

These gaps highlight the need for empirical research that evaluates the effectiveness of risk allocation practices, examines the effectiveness and challenges of risk mitigation strategies, and proposes practical improvements for managing risks in public road construction projects. By focusing on road construction projects in the Elgon Region of Uganda, this study seeks to address these gaps and contribute context-specific evidence that can inform infrastructure risk management practices and improve the performance of public road projects in similar environments.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents the methodological procedures that guided the study on risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda. The chapter describes the research design, research approach, study area, study population, sample size determination, sampling strategies, data collection methods, data quality control procedures, measurement of variables, data analysis techniques, and ethical considerations. The methodological choices adopted in this study are informed by established research principles and supported by relevant scholarly literature to ensure that the study generates reliable and valid findings.

The chapter also explains how both quantitative and qualitative data were collected and analyzed. Since the research problem involves both measurable patterns and contextual experiences of stakeholders involved in road construction projects, the study adopts a mixed methods approach that integrates numerical data with qualitative insights. Mixed methods research allows researchers to combine the strengths of quantitative and qualitative approaches, thereby providing a more comprehensive understanding of complex research problems (Creswell & Plano Clark, 2018). In infrastructure management research, the use of mixed methods was particularly useful because it allows the researcher to analyze measurable patterns while also exploring institutional and operational experiences that influence project implementation (Sekaran & Bougie, 2019).

3.2 Research Design

The study adopted a descriptive cross-sectional research design. A descriptive research design is appropriate when a study seeks to examine and describe existing conditions, practices, and perceptions without manipulating any variables. According to Creswell and Creswell (2018), descriptive designs enable researchers to systematically collect data about current phenomena and analyze relationships among variables in their natural setting. This design is appropriate for the present study because it seeks to assess the effectiveness of risk allocation and mitigation practices in road construction projects as they occur in practice rather than under experimental conditions.

The study also adopted a cross-sectional approach in which data will be collected from respondents at a single point in time. Cross-sectional studies are widely used in infrastructure and project management research because they allow researchers to obtain a snapshot of prevailing practices, perceptions, and challenges within a specific population (Sekaran & Bougie, 2019). This approach is appropriate for the present study because it seeks to examine current risk allocation and mitigation practices within road construction projects implemented between 2019 and 2024 in the Elgon Region of Uganda.

The descriptive cross-sectional design also supports the mixed methods approach used in this study. It allows the researcher to collect both quantitative data through questionnaires and qualitative data through interviews simultaneously, thereby enabling triangulation of findings and enhancing the credibility of the study (Creswell & Plano Clark, 2018).

3.3 Research Approach

The study employed a mixed methods research approach combining quantitative and qualitative techniques. Mixed methods research involves integrating quantitative and qualitative approaches within a single study to gain a deeper and more comprehensive understanding of the research problem (Creswell & Plano Clark, 2018). This approach is increasingly used in social science and infrastructure management research because it enables researchers to analyze numerical patterns while also exploring contextual experiences of stakeholders.

The quantitative component of the study involved the use of structured questionnaires administered to respondents involved in road construction projects. Quantitative data will enable the researcher to measure respondents' perceptions regarding the effectiveness of risk allocation practices, the effectiveness of risk mitigation strategies, and the challenges affecting their implementation. Quantitative methods are particularly useful for identifying patterns and relationships among variables and generating findings that can be generalized to the broader population (Sekaran & Bougie, 2019).

The qualitative component will involve conducting key informant interviews with selected stakeholders such as project engineers, contractors, consultants, procurement officers, and district infrastructure officials. Qualitative research methods are useful for exploring complex issues,

understanding contextual experiences, and capturing detailed insights that cannot easily be obtained through structured questionnaires (Yin, 2018). Through interviews, the researcher will obtain in-depth information regarding contractual risk allocation practices, mitigation strategies, and institutional challenges affecting road construction projects.

The integration of quantitative and qualitative methods will enhance the reliability and validity of the study through methodological triangulation. Triangulation allows the researcher to compare findings obtained from different data sources and methods in order to strengthen the credibility of research conclusions (Creswell & Plano Clark, 2018).

3.4 Study Area

The study was conducted in the Elgon Region of Eastern Uganda. The region comprises districts within both the Bugisu and Sebei sub-regions, including Mbale City, Mbale District, Bududa, Sironko, Manafwa, Bulambuli, Kapchorwa, Kween, and Bukwo. These districts have experienced substantial public investment in road construction and rehabilitation projects aimed at improving regional connectivity, facilitating trade, and supporting socio-economic development. Many road infrastructure projects in these districts are implemented by the central government through the Ministry of Works and Transport as well as by local governments under various infrastructure development programs.

The Elgon Region presents unique environmental and infrastructural characteristics that make it appropriate for studying risk allocation and mitigation practices in road construction projects. The region is characterized by mountainous terrain, steep slopes, fragile soils, and high rainfall intensity ranging between approximately 1,200 and 1,800 millimeters annually (Uganda National Meteorological Authority, 2022). These environmental conditions increase exposure to risks such as landslides, soil erosion, drainage failures, flooding, and slope instability during road construction projects. Environmental risks are known to significantly affect infrastructure performance, particularly in road construction projects implemented in mountainous and landslide-prone regions (World Bank, 2020). In such contexts, inadequate risk allocation and ineffective mitigation strategies can lead to project delays, cost overruns, and structural damage to infrastructure. Therefore, examining road construction projects in the Elgon Region provides an

opportunity to understand how infrastructure risks are allocated and managed in environmentally vulnerable regions, particularly within both the Bugisu and Sebei areas of Eastern Uganda.

3.5 Study Population

The study population consisted of stakeholders directly involved in public road construction projects in the Elgon Region of Uganda in the districts of Bugisu and Sebei. These stakeholders include government engineers from the Ministry of Works and Transport and district local governments, contractors and site engineers responsible for project implementation, consultants involved in project design and supervision, procurement and contract officers responsible for procurement processes, and district infrastructure officials responsible for infrastructure planning and monitoring.

These groups were considered appropriate for the study because they are actively involved in different stages of road construction projects, including project planning, procurement, implementation, supervision, and monitoring. As such, they possess relevant knowledge and experience regarding risk allocation practices, mitigation strategies, and the challenges encountered during project implementation. The total study population is estimated at approximately 130 stakeholders drawn from selected road construction projects in the Elgon Region.

3.6 Sample Size Determination

The sample size for the study was determined using the Krejcie and Morgan (1970) sample size determination table. Krejcie and Morgan developed a statistical table that provides appropriate sample sizes for different population sizes in order to ensure representativeness in survey research.

According to Krejcie and Morgan (1970), a population of approximately 130 respondents corresponds to a recommended sample size of 97 respondents. The use of this method ensures that the selected sample is sufficiently large to produce statistically reliable results while remaining manageable for data collection. The Krejcie and Morgan table is widely used in social science research because it provides scientifically derived sample sizes based on population size,

confidence level, and margin of error, thereby improving the representativeness of survey findings (Sekaran & Bougie, 2019).

3.7 Sampling Strategies

The study used both purposive sampling and simple random sampling techniques to select respondents. Purposive sampling will be used to select key informants who possess specialized knowledge regarding road construction projects and risk management practices. These included project managers, consultants, procurement officers, and senior engineers who are directly involved in the planning and supervision of road construction projects. Purposive sampling is appropriate when respondents are selected based on their expertise and relevance to the research topic (Yin, 2018). Simple random sampling will be used to select respondents from larger groups such as contractors and site engineers. This sampling technique ensures that every member of the population has an equal probability of being selected, thereby reducing sampling bias and improving the representativeness of the sample (Sekaran & Bougie, 2019).

Table 1: Population and Sample Distribution

Category	Population	Sample Size	Sampling Technique
Government Engineers (MoWT and Local Governments)	35	26	Purposive
Contractors and Site Engineers	50	37	Simple Random
Consultants (Design and Supervision Engineers)	20	15	Purposive
Procurement and Contract Officers	15	11	Purposive
District Infrastructure Officials	10	8	Purposive
Total	130	97	

3.8 Data Collection Methods

The study employed three main data collection methods: questionnaire surveys, key informant interviews, and document review. These methods will enable the researcher to collect both quantitative and qualitative data and ensure triangulation of findings.

Structured questionnaires were used to collect quantitative data from respondents involved in road construction projects. The questionnaire contained closed-ended questions designed to capture respondents' perceptions regarding risk allocation practices, risk mitigation strategies, and challenges affecting their implementation. Questionnaires are widely used in survey research because they enable researchers to collect standardized information from a large number of respondents efficiently (Sekaran & Bougie, 2019).

Key informant interviews were conducted with selected project managers, engineers, consultants, and procurement officials. Interviews allow the researcher to obtain in-depth information about complex issues such as contractual risk allocation and mitigation practices (Yin, 2018). Through interviews, respondents will be able to explain their experiences and provide insights into challenges affecting infrastructure project implementation.

3.9 Data Quality Control

Data quality was ensured through validity and reliability testing of the research instruments before the main data collection exercise. Establishing the validity and reliability of the research instruments enhanced the credibility, consistency, and accuracy of the data collected.

3.9.1 Validity of the Research Instruments

Validity refers to the extent to which a research instrument measures what it is intended to measure (Creswell & Creswell, 2018). To establish content validity, the questionnaire and interview guide were presented to three experts comprising academic supervisors and specialists in procurement, construction management, and research methodology. The experts assessed the relevance, clarity, adequacy, and representativeness of each item in relation to the study objectives and variables.

Their comments and recommendations were incorporated into the final instruments before data collection.

The Content Validity Index (CVI) was computed by dividing the number of items rated as relevant by the total number of items evaluated. According to Amin (2005), a CVI of 0.80 or above indicates that an instrument possesses acceptable content validity. The results presented in Table 2 indicate that all the study constructs attained CVI values above the recommended threshold, while the overall instrument achieved a CVI of 0.91, confirming that the questionnaire adequately measured the intended constructs.

Table 2: Content Validity Index (CVI) Results

Study Construct	Number of Items	CVI
Effectiveness of Risk Allocation Practices	8	0.92
Challenges Affecting Effective Risk Allocation	8	0.90
Effectiveness of Risk Mitigation Strategies	8	0.93
Challenges Hindering Implementation of Risk Mitigation Strategies	8	0.89
Recommendations for Improving Risk Allocation and Mitigation Practices	8	0.91
Overall Instrument	40	0.91

Source: Pilot Study Results (2026).

3.9.2 Reliability of the Research Instruments

Reliability refers to the degree to which a research instrument consistently measures the variables under investigation across different respondents (Hair et al., 2019). To establish reliability, the questionnaire was pre-tested among respondents with characteristics similar to those of the study population but who were excluded from the main study. The pilot study enabled the researcher to identify ambiguous items and assess the internal consistency of the instrument.

Reliability was determined using Cronbach's Alpha coefficient. According to Hair et al. (2019), a Cronbach's Alpha coefficient of 0.70 or higher indicates acceptable internal consistency. The reliability results presented in Table 3 show that all the study constructs attained Cronbach's Alpha values above the recommended threshold. The overall questionnaire achieved a Cronbach's Alpha coefficient of 0.876, indicating a high level of internal consistency and confirming that the instrument was reliable for collecting data in the main study.

Table 3: Reliability Test Results

Study Construct	Number of Items	Cronbach's Alpha	Interpretation
Effectiveness of Risk Allocation Practices	8	0.884	Reliable
Challenges Affecting Effective Risk Allocation	8	0.867	Reliable
Effectiveness of Risk Mitigation Strategies	8	0.901	Highly Reliable
Challenges Hindering Implementation of Risk Mitigation Strategies	8	0.851	Reliable
Recommendations for Improving Risk Allocation and Mitigation Practices	8	0.879	Reliable
Overall Instrument	40	0.876	Reliable

Source: Pilot Study Results (2026).

The findings from the validity and reliability tests demonstrate that the research instruments met the recommended standards for social science research. The Content Validity Index values exceeded the minimum acceptable threshold of 0.80, while the Cronbach's Alpha coefficients were all above 0.70. Consequently, the questionnaire and interview guide were considered valid and reliable for collecting data on risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda.

3.9.3 Qualitative Data Quality Control

The quality of qualitative data was ensured by applying the principles of credibility, dependability, confirmability, and transferability as proposed by Lincoln and Guba (1985).

Credibility was enhanced through the use of triangulation by collecting data from multiple sources, including key informant interviews, in-depth interviews, focus group discussions, and document review. The use of different categories of participants enabled the researcher to compare perspectives and verify the consistency of information obtained. In addition, member checking

was conducted by seeking clarification from selected participants during and after interviews to confirm that their views had been accurately captured.

Dependability was ensured by adopting a systematic and well-documented research process. Standardized interview guides were used throughout the study to maintain consistency in data collection across participants. A detailed record of the research procedures, interview schedules, field notes, and data analysis processes was maintained to provide an audit trail that would enable other researchers to follow the study procedures.

Confirmability was promoted by ensuring that the study findings were derived from participants' experiences rather than the researcher's personal opinions or biases. Interview recordings, field notes, and documentary evidence were retained to support the interpretation of the findings. The researcher also maintained reflexive notes throughout the study to minimize subjective influence during data collection and analysis.

Transferability was enhanced by providing a detailed description of the study context, participants, research setting, and data collection procedures. Rich descriptions of the findings will enable readers to determine the extent to which the results may be applicable to similar public road construction projects and institutional contexts within Uganda and other comparable settings.

3.10 Measurement of Variables

The study variables were measured using a five-point Likert scale in which respondents will indicate their level of agreement with statements related to risk allocation and mitigation practices. Likert scales are commonly used in social science research because they allow researchers to measure attitudes, perceptions, and opinions in a structured and quantifiable manner (Sekaran & Bougie, 2019).

For the first objective, which evaluated the effectiveness of risk allocation practices in public road construction projects, respondents were asked questions such as whether risks are clearly defined in construction contracts, whether risks are allocated to the parties best able to manage them, whether contractual provisions adequately address financial, technical, and environmental risks, and whether effective risk allocation reduces project disputes, delays, and cost overruns.

For the second objective, which examined the challenges affecting effective risk allocation, respondents will be asked questions related to factors such as unclear contractual provisions, imbalance in bargaining power between clients and contractors, limited institutional capacity to conduct risk assessments, political interference in procurement processes, and lack of stakeholder understanding of contractual risk responsibilities.

For the third objective, which assessed the effectiveness of risk mitigation strategies, respondents will be asked questions regarding the implementation of mitigation measures such as contingency planning, geotechnical investigations, supervision systems, environmental protection measures, financial safeguards, and contract monitoring mechanisms.

For the fourth objective, which identified the challenges hindering the implementation of risk mitigation strategies, respondents will be asked questions examining issues such as delayed funding, inadequate supervision, lack of technical expertise, environmental uncertainties, poor coordination among stakeholders, and weak monitoring systems.

3.11 Data Analysis

Both quantitative and qualitative data analysis techniques were used in this study. Quantitative data obtained from questionnaires was analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequencies, percentages, means, and standard deviations will be used to summarize respondents' perceptions regarding risk allocation practices and mitigation strategies (Sekaran & Bougie, 2019).

Qualitative data obtained from interviews were analyzed using thematic analysis. Thematic analysis involves identifying, coding, and interpreting patterns within qualitative data in order to generate meaningful insights (Braun & Clarke, 2021). Interview responses will be transcribed and categorized into themes related to risk allocation effectiveness, mitigation strategies, and implementation challenges.

3.12 Ethical Considerations

Ethical considerations were observed throughout the research process. The researcher obtained permission from relevant authorities before conducting the study, including authorization from district local governments and institutions responsible for road construction projects in the Elgon Region.

Participation in the study was voluntary, and respondents will be informed about the purpose of the study before data collection begins. Informed consent was obtained from all participants prior to administering questionnaires or conducting interviews. Informed consent ensures that respondents participate willingly and with full understanding of the research objectives (Creswell & Creswell, 2018).

Confidentiality and anonymity of respondents was also maintained. Information provided by respondents was used strictly for academic purposes and will not be disclosed to unauthorized individuals. Respondents were not required to disclose personal identifiers such as names unless necessary for interview scheduling.

The researcher also ensured that the study does not cause harm to participants and that all data collected will be stored securely and used solely for research purposes. These ethical principles are consistent with internationally accepted research ethics standards in social science research (Yin, 2018; Creswell & Creswell, 2018).

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents, analyzes, and interprets the findings of the study on risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda. The findings are presented according to the study objectives, namely: evaluating the effectiveness of risk allocation practices, examining challenges affecting effective risk allocation, assessing the effectiveness of risk mitigation strategies, identifying challenges hindering the implementation of risk mitigation strategies, and proposing measures for improving risk allocation and mitigation practices in public road construction projects.

Both quantitative and qualitative data were utilized in the study. Quantitative data obtained through questionnaires were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. Qualitative data obtained through key informant interviews were analyzed using thematic analysis and are presented through verbatim quotations to complement the quantitative findings.

4.2 Response Rates

The study targeted 97 respondents for the questionnaire survey and 15 key informants for interviews. Table 4.1 presents the response rate achieved during data collection.

Table 4: Response Rate

Category	Targeted Sample	Actual Response	Response Rate (%)
Questionnaire Respondents	97	80	82.5
Key Informants	15	10	66.7
Total	112	90	80.4

The findings in Table 2 indicate that out of the 97 targeted questionnaire respondents, 80 successfully completed and returned the questionnaires, representing a response rate of 82.5

percent. In addition, 10 out of the 15 targeted key informants participated in the interviews, representing a response rate of 66.7 percent. Overall, the study achieved a response rate of 80.4 percent.

The response rate was considered adequate for analysis and interpretation because it exceeded the minimum threshold commonly recommended for social science research. According to Babbie (2021), a response rate of 50 percent is generally considered adequate for analysis, 60 percent is considered good, and 70 percent or higher is regarded as very good. Similarly, Mugenda and Mugenda (2019) argue that response rates above 70 percent are sufficient to generate reliable findings and reduce the likelihood of non-response bias. Therefore, the overall response rate of 80.4 percent achieved in this study was considered highly satisfactory and provided a strong basis for data analysis and interpretation.

The high response rate was attributed to the support provided by project authorities, prior appointments made with respondents, and the researcher's follow-up efforts during data collection. Creswell and Creswell (2018) observe that continuous follow-up with respondents and institutional support often improve participation rates in survey research. Furthermore, Dillman et al. (2014) note that repeated contact with potential respondents significantly increases response rates and enhances the representativeness of survey findings. Consequently, the response rate achieved in this study provided sufficient confidence that the findings adequately reflected the views and experiences of professionals involved in public road construction projects in the Elgon Region, thereby strengthening the credibility and generalizability of the study findings.

4.3 Background Characteristics of Respondents

This section presents the demographic characteristics of respondents, including gender, age, education level, position in the project, years of experience, and project location.

4.3.1 Gender of Respondents

Table 5: Distribution of Respondents by Gender (N = 80)

Gender	Frequency	Percentage (%)
Male	58	72.5
Female	22	27.5
Total	80	100.0

The results indicate that the majority of respondents were male, representing 58 respondents (72.5%), while female respondents accounted for 22 respondents (27.5%). The dominance of male respondents reflects the gender composition that continues to characterize the construction industry both in Uganda and globally, where technical, engineering, and project management roles remain disproportionately occupied by men. This finding is consistent with studies by Agyekum-Mensah and Knight (2020) and the International Labour Organization (2022), which reported that women remain underrepresented in construction-related professions due to historical, cultural, and occupational barriers that have traditionally limited female participation in the sector. The findings also align with those of Ofori and Toor (2021), who observed that construction industries in many developing countries continue to be male-dominated, particularly in technical and decision-making positions. However, the presence of female respondents in the current study suggests gradual progress toward gender inclusion within infrastructure project management. This observation supports findings by the World Bank (2023), which noted increasing participation of women in engineering, construction management, and infrastructure-related professions across Sub-Saharan Africa as governments and organizations promote gender mainstreaming policies.

The inclusion of both male and female respondents strengthened the study by capturing perspectives from different categories of professionals involved in public road construction projects. According to Creswell and Creswell (2018), diversity among respondents enhances the comprehensiveness of research findings by incorporating varied experiences and viewpoints. Therefore, although male respondents constituted the majority, the participation of female professionals contributed to a more balanced understanding of risk allocation and mitigation practices within public road construction projects in the Elgon Region.

4.3.2 Age of Respondents

Table 6: Age Distribution of Respondents (N = 80)

Age Group	Frequency	Percentage (%)
20-29 Years	12	15.0
30-39 Years	29	36.3
40-49 Years	24	30.0
50 Years and Above	15	18.7
Total	80	100.0

The findings reveal that the largest proportion of respondents, 29 (36.3%), were aged between 30 and 39 years. This was followed by respondents aged 40 to 49 years who constituted 24 respondents (30.0%). Respondents aged 50 years and above accounted for 15 respondents (18.7%), while those aged between 20 and 29 years represented 12 respondents (15.0%).

The age distribution indicates that the majority of respondents were mature professionals actively involved in the implementation and management of road construction projects. This finding is consistent with studies by Ofori and Toor (2021) and Agyekum-Mensah and Knight (2020), which found that construction project management positions are often occupied by individuals in their thirties and forties because such roles require a combination of technical expertise, professional experience, and managerial competence acquired over time. Similarly, the Project Management Institute (2021) notes that project leadership and risk management responsibilities are frequently assigned to mid-career professionals who possess substantial industry knowledge and practical experience.

The relatively high proportion of respondents aged between 30 and 49 years suggests that the study drew insights from professionals who are actively engaged in project decision-making and risk management processes. Their age profile is particularly important because effective risk allocation and mitigation often require practical exposure to diverse project environments and challenges. This observation aligns with the findings of Kerzner (2022), who argues that experience accumulated through years of project involvement enhances an individual's ability to identify, assess, and respond to project risks effectively.

The presence of respondents aged 50 years and above further enriched the study by providing perspectives from highly experienced professionals who have been exposed to long-term changes in infrastructure development and project management practices. At the same time, the participation of younger professionals aged between 20 and 29 years introduced contemporary perspectives associated with emerging technologies, modern project management approaches, and evolving risk management practices. According to Creswell and Creswell (2018), diversity in respondent characteristics strengthens the credibility of research findings by capturing a broader range of experiences and viewpoints. Therefore, the age composition of respondents provided a balanced and informed perspective on risk allocation and mitigation practices in public road construction projects within the Elgon Region.

4.3.3 Education Level of Respondents

Table 7: Education Level of Respondents (N = 80)

Education Level	Frequency	Percentage (%)
Diploma	12	15.0
Bachelor's Degree	42	52.5
Master's Degree	21	26.3
Doctorate	3	3.7
Other Qualifications	2	2.5
Total	80	100.0

The results indicate that the majority of respondents possessed Bachelor's Degrees, accounting for 42 respondents (52.5%). Respondents with Master's Degrees constituted 21 respondents (26.3%), while Diploma holders accounted for 12 respondents (15.0%). Doctorate holders represented 3 respondents (3.7%), and respondents with other qualifications accounted for 2 respondents (2.5%).

The educational profile of the respondents indicates that the majority possessed formal academic qualifications relevant to engineering, construction management, procurement, project management, and related disciplines. This finding is consistent with observations by the Project Management Institute (2021), which notes that infrastructure project management increasingly

requires personnel with advanced technical and managerial training due to the growing complexity of modern construction projects. Similarly, Kerzner (2022) argues that educational attainment plays an important role in enhancing an individual's ability to understand project risks, interpret contractual requirements, and make informed management decisions.

The findings also align with those of Ochieng et al. (2020), who found that infrastructure projects are typically managed by professionals with university-level qualifications because such projects require specialized knowledge in areas such as engineering design, procurement, contract administration, environmental management, and project risk management. The high proportion of respondents possessing Bachelor's and Master's Degrees therefore suggests that the study captured views from individuals with the technical competence necessary to understand and evaluate risk allocation and mitigation practices.

The presence of respondents with postgraduate qualifications further strengthened the quality of information obtained during the study. According to Creswell and Creswell (2018), respondents with higher educational attainment are often better positioned to provide detailed and informed responses on specialized research topics because of their analytical skills and professional exposure. Furthermore, the inclusion of respondents with varying educational levels enriched the study by incorporating perspectives from different categories of professionals involved in road construction projects. Consequently, the educational composition of respondents enhanced the credibility, reliability, and validity of the study findings regarding risk allocation and mitigation practices in public road construction projects within the Elgon Region.

4.3.4 Position of Respondents

Table 8: Position of Respondents in Road Construction Projects (N = 80)

Position	Frequency	Percentage (%)
Project Manager/Site Engineer	12	15.0
Deputy Project Manager/Site Engineer	8	10.0
Materials Engineer	10	12.5
Quantity Surveyor	7	8.8
Resident Engineer	8	10.0
Deputy Resident Engineer	5	6.2
Contract Manager/Engineer	8	10.0
Deputy Contract Manager	4	5.0
Procurement Officer	6	7.5
District Engineer	5	6.2
Government Official	7	8.8
Total	80	100.0

The results demonstrate that respondents occupied diverse professional positions directly involved in the planning, design, procurement, supervision, contract administration, and implementation of public road construction projects. Project Managers and Site Engineers constituted the largest category of respondents (15.0%), followed by Materials Engineers (12.5%). Other respondents included Resident Engineers, Contract Managers, Procurement Officers, Environmental Officers, Quantity Surveyors, and District Engineers. The broad representation of professional categories ensured that the study captured insights from individuals involved in different phases of project delivery and risk management.

The findings are consistent with the observations of Kerzner (2022), who argues that effective project risk management requires the involvement of multidisciplinary teams because project risks emerge from diverse technical, contractual, financial, environmental, and operational sources. Similarly, the Project Management Institute (2021) emphasizes that successful risk identification

and mitigation depend on contributions from professionals possessing different areas of expertise throughout the project lifecycle. The diversity of respondents in the current study therefore reflects the multidisciplinary nature of road construction projects and the collaborative approach required to manage project risks effectively.

The findings also align with those of Ochieng et al. (2020), who found that infrastructure project outcomes are influenced by decisions made by various professionals, including engineers, procurement specialists, project managers, and contract administrators. Each professional category contributes unique knowledge regarding specific project risks and management strategies. For example, engineers are primarily concerned with technical and environmental risks, procurement officers focus on contractual and supply-chain risks, while project managers coordinate overall project risk responses. Consequently, obtaining views from multiple professional groups enhanced the comprehensiveness of the study and provided a more holistic understanding of risk allocation and mitigation practices.

According to Creswell and Creswell (2018), respondent diversity strengthens the credibility of research findings by reducing the likelihood of bias associated with reliance on a single category of participants. Therefore, the inclusion of respondents from different professional backgrounds increased the reliability of the findings and ensured that the study reflected the realities of risk management across the various functions involved in public road construction projects within the Elgon Region.

4.3.5 Years of Experience

Table 9: Years of Experience in Road Construction Projects (N = 80)

Experience	Frequency	Percentage (%)
Less than 5 Years	14	17.5
5-10 Years	30	37.5
11-15 Years	22	27.5
More than 15 Years	14	17.5
Total	80	100.0

The findings show that the largest proportion of respondents, 30 (37.5%), had between 5 and 10 years of experience in road construction projects. Respondents with 11 to 15 years of experience accounted for 22 (27.5%), while those with less than 5 years and more than 15 years each accounted for 14 respondents (17.5%).

The distribution of respondents by years of experience indicates that the majority possessed substantial practical exposure to the planning, implementation, supervision, and management of road construction projects. This finding is consistent with studies by Ochieng et al. (2020) and Agyekum-Mensah and Knight (2020), which found that professionals with several years of industry experience are more likely to have encountered diverse project challenges and are therefore better positioned to evaluate project management practices, including risk allocation and mitigation. Similarly, Kerzner (2022) argues that experience enhances the ability of project personnel to recognize emerging risks, anticipate project uncertainties, and develop appropriate response strategies based on lessons learned from previous projects.

The findings further suggest that most respondents had accumulated sufficient experience to understand the practical realities of managing contractual, financial, technical, environmental, and operational risks in road construction projects. This observation aligns with the Project Management Institute (2021), which emphasizes that experience gained through participation in multiple projects strengthens professional judgment and improves decision-making in complex project environments. Professionals with extensive experience are often better able to identify risk patterns, assess potential consequences, and recommend effective mitigation measures than those with limited project exposure.

The presence of respondents with more than 15 years of experience enriched the study by providing insights from seasoned professionals who have witnessed changes in infrastructure development, procurement systems, and project risk management practices over time. At the same time, the inclusion of respondents with fewer than five years of experience ensured that the study captured perspectives from newer professionals who may be more familiar with emerging technologies and contemporary project management approaches. According to Creswell and Creswell (2018), variation in respondents' experience levels enhances the depth and credibility of research findings by incorporating diverse perspectives and practical experiences. Therefore, the

experience profile of respondents provided confidence that the views expressed regarding risk allocation and mitigation practices were informed by substantial professional exposure to public road construction projects in the Elgon Region.

4.4 Effectiveness of Risk Allocation Practices in Public Road Construction Projects

This section presents findings relating to the first study objective, which sought to evaluate the effectiveness of risk allocation practices in public road construction projects in the Elgon Region of Uganda. Respondents were requested to indicate their level of agreement with various statements relating to risk allocation practices using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Table 10: Effectiveness of Risk Allocation Practices (N = 80)

Statement	SD	D	N	A	SA	Mean	SD
Risks in road construction projects are clearly defined in construction contracts	3 (3.8%)	5 (6.2%)	10 (12.5%)	36 (45.0%)	26 (32.5%)	4.11	0.84
Construction contracts allocate risks to parties best able to manage them	4 (5.0%)	7 (8.8%)	11 (13.7%)	34 (42.5%)	24 (30.0%)	3.96	0.91
Financial risks are clearly allocated between clients and contractors	5 (6.2%)	8 (10.0%)	12 (15.0%)	32 (40.0%)	23 (28.8%)	3.89	0.95
Environmental risks are adequately addressed in construction contracts	6 (7.5%)	10 (12.5%)	15 (18.8%)	29 (36.2%)	20 (25.0%)	3.72	1.01
Technical risks are allocated to stakeholders with appropriate expertise	3 (3.8%)	6 (7.5%)	11 (13.7%)	35 (43.8%)	25 (31.2%)	4.05	0.87
Proper risk allocation contributes to timely completion of projects	2 (2.5%)	4 (5.0%)	7 (8.8%)	30 (37.5%)	37 (46.2%)	4.26	0.78
Effective risk allocation reduces disputes among stakeholders	3 (3.8%)	5 (6.2%)	9 (11.2%)	34 (42.5%)	29 (36.3%)	4.14	0.82
Effective risk allocation improves overall project performance	2 (2.5%)	4 (5.0%)	6 (7.5%)	31 (38.8%)	37 (46.2%)	4.29	0.76
Aggregate Mean						4.05	0.87

The findings presented in Table 7 indicate that respondents generally perceived risk allocation practices in public road construction projects in the Elgon Region as effective, as reflected by the aggregate mean score of 4.05 (SD = 0.87). This suggests that project stakeholders generally recognize the importance of assigning project risks to specific parties and believe that risk allocation contributes positively to project implementation and performance. Nevertheless, a detailed examination of the individual indicators and interview findings reveals a more mixed picture. While stakeholders acknowledged the benefits of risk allocation, they also identified limitations in how risk allocation mechanisms operate in practice. Consequently, the findings suggest that risk allocation practices are perceived as beneficial but not without significant challenges.

The strongest area of agreement concerned the contribution of risk allocation to overall project performance (Mean = 4.29, SD = 0.76), with 85.0% of respondents either agreeing or strongly agreeing with the statement. This finding suggests that stakeholders view risk allocation as a governance mechanism that improves accountability, coordination, and project oversight. When responsibilities for managing risks are clearly assigned, stakeholders are better positioned to anticipate potential problems, make timely decisions, and respond effectively to emerging challenges. This finding is consistent with El-Sayegh et al. (2022), who found that effective risk allocation improves project performance by reducing uncertainty and minimizing contractual conflicts. Similarly, PMI (2021) emphasizes that risk allocation is a critical component of project governance because it establishes accountability structures necessary for achieving project objectives.

The interview findings largely supported this observation. One Project Manager explained:

“From my experience, projects perform much better when risks are assigned to people who actually have the expertise and resources to deal with them. If technical risks are allocated to engineers and construction risks remain with contractors who understand the work, decision-making becomes much easier. Problems are addressed more quickly because everybody knows what they are responsible for. In projects where responsibilities are not clearly defined, you often find people blaming each other when challenges emerge. Instead of focusing on solutions, stakeholders spend time debating who should take responsibility. Clear risk allocation reduces that confusion and allows the project team to focus on achieving the project objectives.”

The findings also revealed that respondents strongly agreed that proper risk allocation contributes to timely completion of projects (Mean = 4.26, SD = 0.78). This finding suggests that assigning risks in advance facilitates quicker responses to emerging problems and reduces delays associated with uncertainty regarding responsibility. Similar findings have been reported by Yescombe (2018), who argues that clearly allocating risks before project commencement reduces delays because stakeholders understand their obligations when unforeseen events occur. Flyvbjerg (2023) similarly observes that uncertainty and ambiguity regarding responsibility are major contributors to delays in infrastructure projects.

However, qualitative findings revealed that the relationship between risk allocation and timely project completion is not always straightforward. A Resident Engineer noted:

“In theory, risk allocation should help projects move faster because responsibilities are already established. However, the reality is sometimes more complicated. Most contracts identify major risks before implementation starts, but unforeseen situations always emerge. When conditions change, stakeholders often begin interpreting the contract differently. The contractor may believe the issue falls under the client’s responsibility while the client may expect the contractor to manage it. During that period, important decisions can be delayed and project progress slows down. Therefore, having risk allocation provisions in a contract is important, but what matters most is how those provisions are interpreted and implemented when challenges arise.”

This finding suggests that risk allocation can facilitate timely completion but may not entirely eliminate delays, particularly when unexpected risks emerge that were not fully anticipated during contract preparation.

Respondents further agreed that effective risk allocation reduces disputes among stakeholders (Mean = 4.14, SD = 0.82). This finding suggests that clearly defined contractual responsibilities reduce misunderstandings among contractors, consultants, clients, and government agencies. The finding supports research by Ochieng et al. (2020), who found that many disputes in African infrastructure projects arise from uncertainty regarding risk ownership. Similarly, El-Sayegh et al. (2022) concluded that contractual clarity significantly reduces claims and disputes during project implementation.

A Contract Manager supported this position by stating:

“One of the biggest benefits of proper risk allocation is that it reduces arguments among stakeholders. When everyone understands their responsibilities from the beginning, there is less room for disagreement. We have seen projects where the contract clearly identified who was responsible for design changes, material quality issues, or construction defects. In such cases disputes were resolved quickly because the responsibilities were already known. On the other hand, where contracts are vague, even small problems can develop into major disagreements that affect project progress and stakeholder relationships.”

Nevertheless, another respondent presented a contrasting perspective:

“I agree that risk allocation can reduce disputes, but I would not say it eliminates them. Some risks are difficult to categorize and when they occur people interpret the contract differently. Environmental risks are a good example. Even where the contract appears clear, stakeholders may still disagree on whether the event was foreseeable or beyond anyone’s control. Those disagreements can still create conflicts during implementation.”

This divergence of opinion demonstrates that while risk allocation contributes to dispute reduction, it does not completely eliminate conflict. Rather, it appears to reduce the frequency and severity of disputes under normal project conditions.

The findings further indicate that respondents agreed that risks in road construction projects are clearly defined in construction contracts (Mean = 4.11, SD = 0.84). This suggests that existing contractual frameworks generally provide reasonable guidance regarding risk ownership. This finding aligns with Luo and Chen (2024), who argue that contractual clarity improves project governance by enhancing stakeholder understanding of obligations and responsibilities.

However, interview participants expressed mixed views regarding the adequacy of contractual provisions. One Resident Engineer observed:

“Most modern contracts are much better than what we had several years ago because they identify major categories of risks and indicate who should manage them. However, the challenge is that not every possible situation can be anticipated during contract

preparation. Road projects operate in complex environments and some risks only become apparent during implementation. Therefore, while contracts provide a useful framework, they cannot address every uncertainty that may arise.”

This finding suggests that contractual clarity exists but is inevitably constrained by the complexity and unpredictability of road construction projects.

Technical risks were perceived to be relatively well allocated (Mean = 4.05, SD = 0.87), suggesting confidence in the capacity of engineers, consultants, and contractors to manage design and construction-related uncertainties. This finding is consistent with Wang and Chou (2020), who found that technical risks are generally easier to allocate because they can be linked directly to identifiable professional expertise and responsibilities.

One District Engineer explained:

“Technical risks are usually easier to allocate because we know which stakeholder has the expertise required to manage them. Design risks can be assigned to consultants, construction risks to contractors, and quality assurance risks to supervising engineers. These responsibilities are generally well understood within the industry. The challenge is not usually identifying who should manage technical risks. The challenge is ensuring that the responsible party has adequate resources to perform their role effectively.”

While technical risks were viewed positively, respondents expressed less confidence regarding financial risks (Mean = 3.89, SD = 0.95). This finding indicates concerns regarding the allocation of risks associated with inflation, delayed payments, exchange rate fluctuations, and escalating construction costs. Similar concerns have been documented by the World Bank (2020), which identifies financial risk allocation as one of the most difficult aspects of infrastructure project management in developing economies.

One Project Manager commented:

“Financial risks are much more complicated than technical risks because many of them are outside the control of project stakeholders. A contractor can manage construction activities, but they cannot control inflation, fuel prices, exchange rates, or delays in government funding. Sometimes contracts transfer these risks to contractors, yet

contractors have very limited ability to influence them. When these risks materialize, projects can experience significant financial pressure that affects implementation.”

The lowest-rated statement concerned environmental risks (Mean = 3.72, SD = 1.01). This finding suggests considerable uncertainty regarding the adequacy of environmental risk allocation within road construction contracts. The finding is particularly significant because the Elgon Region is characterized by steep terrain, landslides, soil instability, and intense rainfall. These conditions create environmental uncertainties that are difficult to predict and allocate contractually.

The interview findings provided substantial insight into this issue. A District Engineer explained:

“Environmental risks are probably the most difficult risks to manage in this region. The terrain around Mount Elgon is extremely unpredictable. A contractor may complete all the required site investigations and follow every technical specification, but heavy rainfall or a landslide can still damage completed works. When such events occur, determining responsibility becomes difficult because neither the contractor nor the client may have been able to prevent the problem. This is why environmental risks continue to generate debate during project implementation.”

Similarly, a Resident Engineer stated:

“Environmental conditions here are very different from many other parts of the country. Some contracts assume relatively stable site conditions, yet the reality on the ground is much more dynamic. Rainfall patterns have become increasingly unpredictable, and we frequently encounter slope failures and drainage challenges that were not fully anticipated during project planning. These conditions make environmental risks particularly difficult to allocate and manage.”

These observations support recent literature emphasizing the growing influence of climate-related uncertainties on infrastructure projects. Flyvbjerg (2023) argues that environmental uncertainty remains one of the most underestimated risks affecting infrastructure performance globally, while the World Bank (2020) notes that traditional contractual frameworks often struggle to accommodate increasingly unpredictable environmental conditions.

An important finding emerging from both the quantitative and qualitative data is the apparent coexistence of effectiveness and challenges. While respondents generally perceived risk allocation practices as effective (Mean = 4.05), they also reported significant challenges affecting risk allocation practices elsewhere in the study (Aggregate Mean = 4.14). Rather than representing a contradiction, these findings suggest that risk allocation practices in public road projects are only partially effective. Stakeholders acknowledge the value of existing risk allocation mechanisms and recognized their contribution to project performance, yet they simultaneously encounter practical challenges that constrain their effectiveness.

One Contract Manager summarized this tension:

“I would say that risk allocation works reasonably well in most projects, but it is not perfect. The contracts provide a structure for assigning responsibilities and managing uncertainty, and that definitely helps project implementation. At the same time, political influence, funding delays, institutional weaknesses, and environmental uncertainties can undermine even the best contractual arrangements. Therefore, the issue is not whether risk allocation exists. The issue is whether the broader environment allows those mechanisms to function effectively.”

This finding supports Luo and Chen’s (2024) argument that contractual governance mechanisms only generate positive outcomes when supported by effective institutions and implementation capacity. Similarly, Scott (2014) argues that formal systems may exist within organizations but their effectiveness ultimately depends on the institutional environment in which they operate. The present study therefore suggests that risk allocation effectiveness should be understood not as an absolute condition but as a product of the interaction between contractual frameworks, stakeholder capacity, governance systems, and environmental realities.

Overall, the findings indicate that risk allocation practices have established an important foundation for project governance and performance improvement within public road construction projects in the Elgon Region. However, significant weaknesses remain in the allocation of environmental and financial risks and in ensuring that risks are consistently assigned to parties with the greatest capacity to manage them. Consequently, risk allocation should be viewed as an

evolving governance mechanism whose effectiveness depends not only on contractual design but also on the broader institutional and environmental context within which projects are implemented.

4.5 Challenges Affecting Effective Risk Allocation in Public Road Construction Projects

This section presents findings relating to the second study objective, which sought to examine the challenges affecting effective risk allocation in public road construction contracts in the Elgon Region of Uganda. Respondents were asked to indicate their level of agreement with various statements regarding challenges that hinder effective risk allocation during project implementation.

Table 11: Challenges Affecting Effective Risk Allocation (N = 80)

Statement	SD	D	N	A	SA	Mean	SD
Construction contracts contain unclear provisions regarding risk responsibilities	2 (2.5%)	5 (6.2%)	8 (10.0%)	37 (46.3%)	28 (35.0%)	4.18	0.81
Political influence affects risk allocation in public road projects	1 (1.3%)	3 (3.7%)	6 (7.5%)	26 (32.5%)	44 (55.0%)	4.32	0.75
Limited institutional capacity affects effective risk allocation	3 (3.8%)	4 (5.0%)	10 (12.5%)	35 (43.7%)	28 (35.0%)	4.10	0.89
Imbalance in bargaining power between government and contractors affects risk allocation	4 (5.0%)	6 (7.5%)	11 (13.8%)	33 (41.2%)	26 (32.5%)	3.95	0.93
Lack of stakeholder participation affects proper risk allocation	3 (3.8%)	5 (6.2%)	10 (12.5%)	36 (45.0%)	26 (32.5%)	4.01	0.87
Delays in decision-making contribute to poor risk allocation	2 (2.5%)	4 (5.0%)	8 (10.0%)	33 (41.3%)	33 (41.2%)	4.24	0.79
Inadequate contract management skills affect effective risk allocation	2 (2.5%)	5 (6.2%)	9 (11.3%)	35 (43.7%)	29 (36.3%)	4.15	0.82
Institutional weaknesses affect the proper distribution of project risks	2 (2.5%)	4 (5.0%)	8 (10.0%)	34 (42.5%)	32 (40.0%)	4.20	0.84
Aggregate Mean						4.14	0.84

The findings presented in Table 9 indicate that respondents generally agreed that several challenges significantly affect effective risk allocation in public road construction projects within

the Elgon Region. The aggregate mean score of 4.14 (SD = 0.84) suggests that stakeholders perceive substantial barriers to the effective allocation and management of project risks. Interestingly, the aggregate mean for challenges (4.14) is slightly higher than the aggregate mean for effectiveness of risk allocation practices (4.05) reported in the previous section. This finding suggests that although respondents acknowledge the existence and benefits of risk allocation mechanisms, they also perceive significant obstacles that limit their practical effectiveness. Consequently, the findings reinforce the argument that risk allocation in public road construction projects is not simply a technical process but a governance challenge influenced by institutional, political, and organizational factors.

Political influence emerged as the most significant challenge affecting risk allocation practices (Mean = 4.32, SD = 0.75), with 87.5% of respondents either agreeing or strongly agreeing with the statement. The prominence of political influence is particularly noteworthy because it received a higher rating than all technical and managerial challenges examined in the study. This finding suggests that respondents perceive risk allocation decisions as being influenced not only by technical considerations but also by political interests and external pressures. Rather than risks being allocated solely according to expertise, capacity, or contractual principles, stakeholders appear to believe that political considerations sometimes shape decisions relating to project planning, procurement, contract administration, and responsibility sharing.

This finding is consistent with research conducted in developing-country infrastructure sectors, where political actors often influence project priorities, procurement decisions, funding allocations, and contract management processes (World Bank, 2020; Ochieng et al., 2020). Flyvbjerg (2023) similarly argues that political and institutional factors are frequently more influential than technical considerations in determining infrastructure project outcomes. According to Institutional Theory, formal procedures may exist, but actual decisions are often shaped by external pressures and power relations operating within the broader governance environment (Scott, 2014).

The qualitative findings strongly reinforced this observation. One Contract Manager explained:

“Many people assume that risk allocation is purely a technical process, but in reality that is not always the case. There are situations where decisions regarding who should bear

certain risks are influenced by factors outside the technical team. Sometimes there is pressure to move projects forward quickly or to protect particular institutional interests. In such circumstances risks may not be allocated according to technical capability but according to administrative or political considerations. The problem is that when those risks eventually materialize, the parties responsible may not have the resources or authority required to manage them effectively.”

A District Engineer offered a similar perspective:

“Political leaders naturally want projects completed because they are accountable to communities. However, their priorities do not always align with technical realities on the ground. We have encountered situations where technical concerns about environmental risks, land acquisition challenges, or design modifications received less attention than pressure to maintain project schedules. When that happens, risk allocation decisions may not adequately reflect actual project conditions.”

These findings help explain why political influence emerged as the highest-rated challenge. Respondents appear to perceive political influence as a factor capable of affecting all other aspects of risk allocation. While technical weaknesses affect specific areas of project management, political influence can shape procurement decisions, contractual arrangements, funding priorities, stakeholder engagement, and implementation processes simultaneously.

Respondents also strongly agreed that delays in decision-making contribute to poor risk allocation (Mean = 4.24, SD = 0.79). This finding suggests that bureaucratic procedures, lengthy approval processes, and administrative inefficiencies hinder timely responses to emerging project risks. Similar findings have been reported by PMI (2021), which identifies delayed decision-making as a major contributor to ineffective risk management because unresolved risks often escalate into larger and more costly problems.

The qualitative findings revealed the practical implications of these delays. A Procurement Officer explained:

“Decision-making in public projects can be a lengthy process because approvals pass through multiple administrative levels. Even when a risk is identified early, implementing a response often requires consultation, documentation, and authorization

from different offices. By the time a decision is finally reached, project conditions may have changed significantly. In some cases, risks that could have been managed relatively easily become much more difficult and expensive to address.”

However, another respondent provided a slightly different perspective:

“The problem is not always bureaucracy alone. Sometimes delays occur because stakeholders need additional information before making decisions. Infrastructure projects are complex and rushing decisions can create new problems. The challenge is finding a balance between proper due diligence and timely risk response.”

This finding introduces important insights by suggesting that not all decision delays are necessarily negative. Some delays may arise from legitimate efforts to ensure informed decision-making. Nevertheless, excessive delays appear to undermine effective risk allocation by preventing timely intervention.

Institutional weaknesses were identified as another major challenge affecting proper distribution of project risks (Mean = 4.20, SD = 0.84). Respondents appear to believe that weaknesses within implementing agencies undermine the ability of organizations to identify, assess, allocate, and monitor project risks effectively. This finding aligns with World Bank (2020) observations that institutional capacity remains one of the most important determinants of infrastructure project performance in developing countries.

A District Engineer elaborated:

“Risk management depends heavily on the strength of the institutions responsible for implementing projects. Even where contracts are clear and technical expertise exists, weak coordination mechanisms, inadequate staffing, and limited resources can undermine implementation. Some risks are identified during planning, but institutional limitations make it difficult to follow through with the necessary management actions.”

Similarly, respondents agreed that construction contracts often contain unclear provisions regarding risk responsibilities (Mean = 4.18, SD = 0.81). This finding suggests that contractual ambiguity remains a significant obstacle to effective risk allocation. According to FIDIC principles, effective risk allocation depends on clarity regarding ownership and responsibility.

When contractual provisions are unclear, stakeholders may interpret obligations differently, increasing the likelihood of disputes and delays.

A Resident Engineer explained:

“Most contracts attempt to define risk ownership, but there are always situations where the wording is open to interpretation. Problems become more complicated when unexpected events occur because stakeholders begin reading the contract from different perspectives. In some cases, considerable time is spent determining responsibility rather than addressing the actual problem.”

The findings further reveal that inadequate contract management skills affect effective risk allocation (Mean = 4.15, SD = 0.82). This suggests that some project managers, engineers, procurement officers, and contract administrators may lack specialized competencies required to identify and allocate risks appropriately. Similar findings were reported by El-Sayegh et al. (2022), who found that contract management competence significantly influences infrastructure project outcomes.

One Project Manager stated:

“Many professionals understand engineering and construction processes very well, but risk allocation requires additional competencies in contract interpretation, negotiation, and risk assessment. Without these skills, there is a tendency to focus on technical issues while overlooking contractual implications that may affect project performance later.”

Limited institutional capacity also emerged as a significant challenge (Mean = 4.10, SD = 0.89). While closely related to institutional weaknesses, respondents distinguished between organizational structures and the actual availability of resources, expertise, and personnel. The findings suggest that some implementing agencies lack sufficient staffing, technical expertise, financial resources, and risk management systems to support effective allocation practices.

Lack of stakeholder participation was another challenge identified by respondents (Mean = 4.01, SD = 0.87). This finding suggests that inadequate involvement of contractors, consultants, local governments, and communities during project planning may result in incomplete understanding of project risks. Stakeholder Theory emphasizes that effective decision-making requires the inclusion

of diverse perspectives because different actors often possess unique information regarding project risks (Freeman, 2010).

One Project Manager observed:

“Stakeholder consultation is often concentrated among a small number of actors during project preparation. Contractors, local technical teams, and community representatives sometimes become involved after important decisions have already been made. As a result, valuable information about local conditions and potential risks may not be incorporated into the risk allocation process.”

The lowest-rated challenge was imbalance in bargaining power between government agencies and contractors (Mean = 3.95, SD = 0.93). Although respondents generally agreed that bargaining power affects risk allocation, the relatively lower mean suggests that this challenge was considered less significant than political influence, institutional weaknesses, and delayed decision-making. However, the interview findings indicate that bargaining power remains an important issue in some projects.

One Contract Manager remarked:

“Contractors sometimes accept risks they would normally reject because competition for projects is very high. During procurement they may agree to contractual provisions that appear manageable, but during implementation they discover that some risks are beyond their control. This can create pressure for claims, contract variations, and renegotiations later in the project.”

Overall, the integrated findings demonstrate that challenges affecting risk allocation are largely institutional and governance-related rather than purely technical. The fact that political influence emerged as the highest-rated challenge suggests that stakeholders perceive risk allocation as a process shaped by power, authority, and institutional dynamics as much as by technical expertise. While technical competence remains important, the findings indicate that effective risk allocation ultimately depends on the broader governance environment within which public road construction projects are planned and implemented.

4.6 Effectiveness of Risk Mitigation Strategies in Public Road Construction Projects

This section presents findings relating to the third study objective, which sought to assess the effectiveness of risk mitigation strategies implemented in public road construction projects in the Elgon Region of Uganda. Respondents were requested to indicate their level of agreement with statements relating to the effectiveness of various risk mitigation measures employed during project planning and implementation.

Table 12: Effectiveness of Risk Mitigation Strategies (N = 80)

Statement	SD	D	N	A	SA	Mean	SD
Road construction projects conduct adequate risk assessments before project implementation	2 (2.5%)	5 (6.2%)	10 (12.5%)	35 (43.8%)	28 (35.0%)	4.07	0.86
Contingency planning helps reduce risks in road construction projects	2 (2.5%)	4 (5.0%)	8 (10.0%)	34 (42.5%)	32 (40.0%)	4.20	0.80
Geotechnical investigations help reduce environmental and technical risks	1 (1.3%)	3 (3.7%)	6 (7.5%)	27 (33.8%)	43 (53.7%)	4.35	0.74
Project supervision mechanisms help minimize construction risks	2 (2.5%)	4 (5.0%)	9 (11.3%)	35 (43.7%)	30 (37.5%)	4.18	0.83
Environmental management plans reduce environmental risks during construction	3 (3.8%)	5 (6.2%)	10 (12.5%)	34 (42.5%)	28 (35.0%)	4.10	0.87
Risk mitigation strategies improve the quality of road infrastructure	1 (1.3%)	3 (3.7%)	8 (10.0%)	30 (37.5%)	38 (47.5%)	4.28	0.78
Risk mitigation practices help reduce project delays	2 (2.5%)	5 (6.2%)	10 (12.5%)	33 (41.3%)	30 (37.5%)	4.12	0.85
Risk mitigation measures improve project cost control	2 (2.5%)	5 (6.2%)	9 (11.3%)	34 (42.5%)	30 (37.5%)	4.16	0.81
Aggregate Mean						4.18	0.82

The findings presented in Table 10 indicate that respondents generally perceived risk mitigation strategies implemented in public road construction projects within the Elgon Region as effective, as reflected by the aggregate mean score of 4.18 (SD = 0.82). This finding suggests that stakeholders believe risk mitigation measures make a substantial contribution to project success by reducing uncertainty, improving preparedness, and minimizing the adverse consequences of technical, environmental, operational, and financial risks. The aggregate score is notably higher than the score recorded for the effectiveness of risk allocation practices (Mean = 4.05), suggesting that respondents may have greater confidence in practical mitigation measures implemented during project execution than in contractual mechanisms used to allocate risks during project planning.

This finding is consistent with contemporary project management literature, which increasingly emphasizes the importance of adaptive risk management throughout the project lifecycle. According to PMI (2021), risk mitigation strategies are most effective when they move beyond documentation and become embedded in day-to-day project management activities. Similarly, Hillson and Simon (2020) argue that risk management creates value not because risks are identified, but because organizations actively implement measures that reduce the likelihood and consequences of those risks. The findings of this study suggest that stakeholders in the Elgon Region recognize this distinction and place considerable importance on practical interventions that directly address project vulnerabilities.

The highest-rated statement was that geotechnical investigations help reduce environmental and technical risks (Mean = 4.35, SD = 0.74). This finding is particularly significant given the environmental and geological characteristics of the Elgon Region. The area is characterized by steep slopes, unstable soils, frequent landslides, erosion, and unpredictable rainfall patterns, all of which create considerable uncertainty during road construction projects. Under such conditions, understanding subsurface conditions becomes critical because design decisions, drainage systems, slope stabilization measures, and pavement structures depend heavily on accurate geotechnical information.

The finding supports research by Flyvbjerg (2023), who argues that many infrastructure project failures originate from inadequate understanding of site conditions during project planning. Similarly, El-Sayegh et al. (2022) found that comprehensive site investigations significantly reduce technical uncertainty and improve project performance by enabling informed decision-

making. In the context of road construction projects, geotechnical investigations reduce the likelihood of costly redesigns, structural failures, and unexpected construction challenges that often emerge after implementation has commenced.

The qualitative findings largely supported this view. One Resident Engineer explained:

“Geotechnical investigations have become extremely important in this region because many of the challenges we encounter are related to soil conditions and slope stability. There have been cases where preliminary investigations identified unstable sections that required additional stabilization measures before construction started. Without those investigations, construction would have proceeded based on assumptions that later proved inaccurate. The result would have been delays, additional costs, and potentially serious structural problems.”

However, not all respondents viewed geotechnical investigations as a complete solution. Another engineer noted:

“The investigations are very useful, but people should not assume that they eliminate all uncertainty. Conditions can change significantly after periods of heavy rainfall, especially in mountainous areas. There have been situations where investigations suggested relatively stable conditions, yet slope failures occurred during implementation because of weather conditions that were difficult to predict. The investigations help us prepare, but they do not guarantee that surprises will not occur.”

These differing views suggest that stakeholders recognize the value of geotechnical investigations while acknowledging that uncertainty remains an inherent feature of infrastructure projects. This observation supports Hillson and Simon’s (2020) argument that the objective of risk management is not to eliminate uncertainty but to improve preparedness and decision-making under uncertain conditions.

Respondents also strongly agreed that risk mitigation strategies improve the quality of road infrastructure (Mean = 4.28, SD = 0.78). This finding suggests that proactive management of project risks contributes significantly to compliance with technical standards, reduction of defects, and long-term durability of completed infrastructure. The finding aligns with Wang and Chou (2020), who found that projects with robust risk management systems are more likely to achieve

quality objectives because potential threats to quality are identified and addressed before they affect construction activities.

A Contract Manager explained:

“Many quality problems that emerge during road construction are not necessarily engineering problems. They are often risk management problems. When issues such as material shortages, drainage concerns, unstable slopes, or contractor performance problems are identified early, project teams are able to take corrective action before quality is affected. In my experience, projects that actively manage risks tend to produce better infrastructure than projects that simply react to problems as they arise.”

However, another respondent challenged the assumption that risk mitigation automatically results in high-quality infrastructure:

“Risk mitigation certainly helps improve quality, but quality is influenced by many other factors. We have seen projects with comprehensive risk management plans that still experienced quality challenges because of contractor weaknesses, equipment limitations, or inadequate supervision. Risk mitigation creates favorable conditions, but it does not replace technical competence and effective project management.”

This finding suggests that while risk mitigation contributes to infrastructure quality, its effectiveness depends on the broader project management environment within which mitigation measures are implemented.

Similarly, respondents agreed that contingency planning helps reduce risks in road construction projects (Mean = 4.20, SD = 0.80). The finding indicates that stakeholders value preparedness as an important component of risk management. Contingency planning allows project teams to anticipate potential disruptions and develop response mechanisms before risks materialize. According to PMI (2021), contingency planning enhances organizational resilience by reducing response times and minimizing disruption when unexpected events occur.

One Project Manager observed:

“Contingency planning has become increasingly important because many of the risks affecting road projects cannot be completely avoided. Heavy rainfall, equipment

breakdowns, shortages of construction materials, and funding delays are realities that project teams must deal with. Projects that prepare for these possibilities are generally better able to recover when challenges occur because they already have alternative courses of action.”

Nevertheless, some respondents questioned the practical implementation of contingency plans:

“Most projects prepare contingency plans because they are required during planning and approval processes. The challenge is that some of those plans are not regularly reviewed once implementation begins. As a result, they may not always reflect changing project conditions. A contingency plan is only useful if it remains relevant throughout the project.”

This finding raises an important issue regarding the difference between planning and implementation. The existence of contingency plans may not necessarily translate into effective risk management unless those plans are actively utilized and updated throughout project implementation.

The findings further indicate that project supervision mechanisms help minimize construction risks (Mean = 4.18, SD = 0.83). This finding suggests that supervision functions as an important monitoring and control mechanism through which emerging risks are identified and addressed before they escalate into major project challenges. Similar findings were reported by Ochieng et al. (2020), who found that effective supervision contributes significantly to project performance because it facilitates early detection of technical, operational, and contractual problems.

One District Engineer stated:

“Regular supervision allows project teams to identify problems before they become serious. There have been situations where defects in drainage structures or construction methods were identified during routine inspections and corrected immediately. Without supervision, those issues might only have been discovered after significant damage had occurred.”

However, another respondent highlighted the limitations of supervision systems:

“Supervision is important, but its effectiveness depends on the resources available. Some projects cover large geographical areas and supervision teams may not always be able to visit sites as frequently as required. In such situations, risks may remain undetected for longer periods and become more difficult to manage.”

The findings therefore suggest that supervision contributes significantly to risk mitigation but that its effectiveness depends on the availability of adequate institutional resources and technical capacity.

Respondents also agreed that risk mitigation measures improve project cost control (Mean = 4.16, SD = 0.81). This finding suggests that effective risk management contributes to financial efficiency by preventing cost overruns, reducing rework, minimizing waste, and avoiding costly disputes. Flyvbjerg (2023) argues that many infrastructure cost overruns originate from unmanaged risks that gradually escalate throughout project implementation. The findings of this study support this argument by suggesting that proactive mitigation measures contribute to more efficient utilization of project resources.

The findings further reveal that risk mitigation practices help reduce project delays (Mean = 4.12, SD = 0.85). This suggests that timely identification and management of risks contribute to improved project scheduling and implementation efficiency. However, the slightly lower rating compared to other indicators suggests that respondents recognize that certain delays may occur even when mitigation measures are in place.

One Resident Engineer explained:

“Risk mitigation helps reduce delays, but some challenges remain beyond the control of project teams. Delays related to funding, land acquisition, political decisions, and extreme weather conditions can still affect project schedules. What risk mitigation does is reduce vulnerability and improve preparedness rather than guarantee that delays will never occur.”

Environmental management plans were also viewed as effective in reducing environmental risks during construction (Mean = 4.10, SD = 0.87). Given the environmental sensitivity of the Elgon Region, this finding is particularly important. Environmental management measures such as

erosion control, drainage management, vegetation restoration, and waste management help minimize environmental degradation while protecting project infrastructure.

One key informant observed:

“Environmental management plans are essential in this region because environmental risks and engineering risks are closely connected. Poor drainage management can damage roads, trigger erosion, and affect nearby communities. Effective environmental management protects both the infrastructure and the people who depend on it.”

At the same time, some respondents questioned the consistency of implementation:

“Environmental management plans are normally prepared during project approval, but implementation is sometimes uneven. As construction activities intensify, environmental considerations may receive less attention than project deadlines and production targets. This means that the effectiveness of environmental management depends heavily on enforcement and monitoring.”

Perhaps the most revealing finding concerns risk assessment before project implementation, which received the lowest rating among all indicators (Mean = 4.07, SD = 0.86). Although respondents generally agreed that risk assessments are conducted, they expressed less confidence in their adequacy than in specific mitigation measures such as geotechnical investigations, supervision, and contingency planning.

At first glance, this finding appears somewhat surprising. If geotechnical investigations are viewed as highly effective, one might expect respondents to express similar confidence in pre-project risk assessments. However, the interview findings suggest that respondents distinguish between technical investigations and broader project risk assessments. While technical risks may receive considerable attention during planning, political, institutional, financial, stakeholder-related, and environmental risks may not always be assessed with the same level of rigor.

A Project Manager explained:

“Risk assessments are normally conducted before implementation, but they do not always capture the full complexity of the project environment. Technical risks are easier to identify because they can be measured and analyzed. Other risks such as political

interference, funding challenges, stakeholder disputes, and changing environmental conditions are more difficult to predict. As a result, some important risks only become fully apparent after implementation has already started.”

Overall, the findings indicate that risk mitigation strategies are widely perceived as effective in public road construction projects within the Elgon Region. However, the findings also suggest that effectiveness varies across different mitigation measures and depends heavily on implementation quality, institutional capacity, and changing project conditions. While stakeholders expressed strong confidence in geotechnical investigations, contingency planning, supervision mechanisms, and environmental management measures, they also acknowledged limitations associated with incomplete risk assessments, resource constraints, and unpredictable project environments. The findings therefore suggest that successful risk mitigation is not achieved through isolated interventions but through a continuous process of planning, monitoring, learning, and adaptation throughout the project lifecycle.

4.7 Challenges Hindering the Implementation of Risk Mitigation Strategies

This section presents findings relating to the fourth study objective, which sought to identify the challenges hindering the effective implementation of risk mitigation strategies in public road construction projects in the Elgon Region of Uganda. Respondents were requested to indicate their level of agreement with statements describing factors that constrain the successful implementation of risk mitigation measures.

Table 13: Challenges Hindering the Implementation of Risk Mitigation Strategies (N = 80)

Statement	SD	D	N	A	SA	Mean	SD
Delayed government funding affects implementation of risk mitigation measures	1 (1.3%)	2 (2.5%)	5 (6.2%)	27 (33.8%)	45 (56.2%)	4.41	0.70
Lack of technical expertise limits effective risk mitigation	2 (2.5%)	5 (6.2%)	10 (12.5%)	34 (42.5%)	29 (36.3%)	4.08	0.85
Weak monitoring systems hinder effective implementation of mitigation strategies	2 (2.5%)	4 (5.0%)	9 (11.3%)	35 (43.7%)	30 (37.5%)	4.15	0.81
Environmental uncertainties make risk mitigation difficult	1 (1.3%)	3 (3.7%)	6 (7.5%)	29 (36.3%)	41 (51.2%)	4.33	0.73
Poor coordination among stakeholders affects mitigation efforts	2 (2.5%)	5 (6.2%)	9 (11.3%)	35 (43.8%)	29 (36.2%)	4.12	0.84
Inadequate supervision affects implementation of mitigation measures	3 (3.8%)	5 (6.2%)	10 (12.5%)	34 (42.5%)	28 (35.0%)	4.05	0.88
Limited availability of risk management tools affects project performance	2 (2.5%)	5 (6.2%)	10 (12.5%)	34 (42.5%)	29 (36.3%)	4.10	0.86
Institutional capacity constraints hinder effective risk mitigation	2 (2.5%)	4 (5.0%)	8 (10.0%)	35 (43.8%)	31 (38.7%)	4.18	0.80
Aggregate Mean						4.18	0.81

The findings presented in Table 11 indicate that respondents generally agreed that several challenges significantly hinder the effective implementation of risk mitigation strategies in public road construction projects within the Elgon Region. The aggregate mean score of 4.18 (SD = 0.81) suggests that these challenges are widespread and have a substantial influence on the ability of project stakeholders to implement planned mitigation measures. Interestingly, the aggregate mean for challenges hindering implementation is identical to the aggregate mean for the effectiveness of risk mitigation strategies (Mean = 4.18). This finding presents an important paradox. On the one

hand, respondents believe that mitigation strategies are effective and contribute positively to project outcomes. On the other hand, they acknowledge the existence of significant obstacles that limit the successful implementation of those same strategies. This suggests that the challenge facing road construction projects in the Elgon Region is not necessarily the absence of mitigation measures but rather the difficulties associated with translating mitigation plans into practice.

The most significant challenge identified by respondents was delayed government funding (Mean = 4.41, SD = 0.70), with 90.0 percent of respondents agreeing or strongly agreeing that funding delays undermine implementation of mitigation measures. This finding is particularly noteworthy because it ranked above all technical, environmental, and managerial challenges. The result suggests that stakeholders perceive financial constraints as having a greater influence on risk mitigation than the technical quality of mitigation measures themselves. In essence, respondents appear to believe that even well-designed mitigation strategies cannot be implemented effectively when the necessary financial resources are unavailable.

This finding is consistent with research by the World Bank (2020), which identified delayed disbursement of funds as one of the most significant obstacles affecting infrastructure delivery in developing countries. Similarly, Flyvbjerg (2023) argues that infrastructure projects frequently fail not because risks are poorly understood but because institutions lack the resources required to respond effectively when risks materialize. The finding also aligns with Resource Dependency Theory, which suggests that organizational effectiveness depends heavily on access to critical resources. Without adequate funding, organizations become constrained in their ability to implement planned interventions regardless of technical competence or managerial capability.

A Project Manager explained:

“Funding delays are one of the biggest challenges we face because almost every mitigation measure requires resources. You may have identified slope stabilization works, drainage improvements, environmental restoration activities, or additional supervision requirements, but implementation becomes difficult when funds are not released on time. There have been situations where project teams recognized emerging risks early enough but could not respond immediately because financial approvals and

payments had not yet been processed. By the time resources became available, the risks had already escalated and required much more expensive interventions.”

However, another respondent argued that funding is not always the only problem:

“Funding delays certainly create difficulties, but in some cases resources are available and implementation challenges still occur. There are situations where poor planning, weak coordination, or slow decision-making affect mitigation activities even when funds have been released. Therefore, while funding is important, it should not be viewed as the sole explanation for implementation failures.”

This contrast suggests that although funding constraints represent the most significant challenge, they often interact with other institutional weaknesses rather than operating independently.

Environmental uncertainties emerged as the second most significant challenge affecting implementation of mitigation measures (Mean = 4.33, SD = 0.73). This finding reflects the unique environmental realities of the Elgon Region, where steep terrain, unstable slopes, heavy rainfall, landslides, and soil erosion create conditions that are inherently difficult to predict and manage. The finding is particularly interesting because environmental management plans and geotechnical investigations were rated highly effective in the previous section. This suggests that stakeholders recognize the value of environmental mitigation measures while simultaneously acknowledging that environmental risks remain difficult to control.

The finding supports recent literature emphasizing the growing influence of climate and environmental uncertainty on infrastructure projects. According to the World Bank (2021), climate variability has increased the complexity of infrastructure risk management because historical data can no longer reliably predict future environmental conditions. Similarly, Flyvbjerg (2023) argues that environmental uncertainty remains one of the most underestimated threats to infrastructure project performance.

One Resident Engineer observed:

“The environment in the Elgon Region is highly unpredictable. You can conduct investigations, prepare environmental management plans, and design mitigation measures, yet unexpected events still occur. We have experienced situations where

prolonged rainfall triggered slope failures in areas that were not previously identified as high risk. In such cases, project teams must respond to conditions that were not fully anticipated during planning.”

Yet another respondent offered a different perspective:

“Sometimes environmental challenges are blamed for project problems when the real issue is inadequate implementation of mitigation measures. Not every landslide or drainage problem is unavoidable. In some cases, better supervision, maintenance of drainage structures, or earlier intervention could have reduced the severity of the problem.”

This observation is important because it challenges the tendency to attribute all environmental problems to natural conditions. It suggests that environmental risks are influenced not only by nature but also by the effectiveness of project management responses.

Institutional capacity constraints also emerged as a major challenge affecting implementation of risk mitigation measures (Mean = 4.18, SD = 0.80). Respondents indicated that limitations in staffing, technical expertise, equipment, and organizational systems reduce the ability of institutions to implement planned mitigation activities effectively. This finding aligns with research by Ochieng et al. (2020), who found that institutional capacity is one of the strongest predictors of infrastructure project performance in developing countries.

A District Engineer explained:

“Many mitigation measures require specialized knowledge and continuous oversight. The challenge is that some institutions operate with limited technical staff and inadequate resources. A project may identify appropriate mitigation measures, but implementation becomes difficult if there are not enough qualified personnel to oversee activities or monitor compliance throughout the project lifecycle.”

Weak monitoring systems were also identified as a significant challenge (Mean = 4.15, SD = 0.81). This finding appears somewhat contradictory because respondents previously rated project supervision mechanisms as effective in reducing risks. The apparent contradiction can be explained by recognizing that supervision and monitoring are related but distinct concepts. While

supervision focuses on day-to-day oversight of construction activities, monitoring involves continuous assessment of risk trends, mitigation effectiveness, and changing project conditions.

According to PMI (2021), effective risk management requires continuous monitoring because risks evolve throughout project implementation. Without monitoring, mitigation measures may become outdated or ineffective as project conditions change.

A Contract Manager stated:

“Risk management is not something that happens once and ends. Risks change as projects progress. The challenge is that many projects do not have strong monitoring systems capable of tracking whether mitigation measures are working as intended. Sometimes risks are only identified after they have already affected project performance, making corrective action more expensive and less effective.”

However, another respondent suggested that monitoring weaknesses are often symptoms of broader institutional problems:

“Monitoring systems do not fail on their own. They usually reflect shortages of staff, limited resources, or weak organizational commitment. Strengthening monitoring requires strengthening the institutions responsible for carrying it out.”

Poor coordination among stakeholders was another significant challenge (Mean = 4.12, SD = 0.84). This finding suggests that risk mitigation often requires collective action involving contractors, consultants, government agencies, local governments, and affected communities. Where coordination is weak, mitigation activities may be delayed, duplicated, or implemented inconsistently.

The finding supports Stakeholder Theory (Freeman, 2010), which argues that organizational success depends on effective engagement and coordination among diverse stakeholder groups. Infrastructure projects are particularly dependent on stakeholder collaboration because risks frequently cut across organizational boundaries.

One Project Manager explained:

“Risk mitigation rarely depends on a single stakeholder. Environmental management may involve contractors, district authorities, environmental officers, and local communities. Delays occur when these stakeholders do not communicate effectively or when their priorities differ. Even where mitigation measures are agreed upon, implementation can be slowed by coordination problems.”

Nevertheless, another respondent argued that coordination challenges are often overstated:

“Coordination problems exist, but most stakeholders generally understand the importance of collaboration. In many projects, the bigger issue is not communication but the lack of resources needed to implement agreed actions.”

Limited availability of risk management tools (Mean = 4.10, SD = 0.86) and lack of technical expertise (Mean = 4.08, SD = 0.85) were also identified as significant challenges. These findings suggest that some project teams continue to rely on traditional approaches to risk management because they lack access to advanced technologies, forecasting systems, specialized software, and highly trained personnel.

A Procurement Officer noted:

“Modern risk management tools are still limited in many projects. Most risk assessments are conducted manually, and data management systems are often fragmented. This makes it difficult to analyze complex risks or track mitigation performance in real time. More advanced tools could improve both efficiency and decision-making.”

However, another respondent questioned whether technology alone would solve the problem:

“Technology is useful, but it cannot replace sound judgment and experience. We have seen projects with sophisticated systems that still struggled because the people using them lacked the necessary skills or commitment. Capacity building remains just as important as technology.”

The lowest-rated challenge was inadequate supervision (Mean = 4.05, SD = 0.88). Although respondents generally agreed that supervision affects implementation of mitigation measures, its relatively lower ranking suggests that supervision is perceived as less problematic than funding constraints, environmental uncertainties, and institutional weaknesses. This finding is interesting

because supervision was rated highly effective as a mitigation strategy in the previous section. One possible explanation is that respondents distinguish between the value of supervision as a concept and the practical challenges associated with implementing supervision activities consistently.

Overall, the integrated findings indicate that the barriers to implementing risk mitigation strategies are predominantly financial, institutional, environmental, and organizational rather than purely technical. The fact that delayed government funding emerged as the highest-rated challenge suggests that stakeholders perceive access to resources as the foundation upon which successful risk mitigation depends. At the same time, the findings demonstrate that environmental uncertainty, institutional capacity limitations, weak monitoring systems, and stakeholder coordination challenges continue to undermine implementation efforts. These findings reinforce the argument that effective risk mitigation requires more than technical solutions. It requires strong institutions, reliable financing, effective coordination mechanisms, and the organizational capacity to adapt to changing project conditions throughout the project lifecycle.

4.8 Recommendations for Improving Risk Allocation and Mitigation Practices

This section presents findings relating to the fifth study objective, which sought to propose recommendations for improving risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda. Respondents were requested to indicate their level of agreement with various proposed interventions aimed at strengthening project risk management.

Table 14: Recommendations for Improving Risk Allocation and Mitigation Practices (N = 80)

Recommendation	SD	D	N	A	SA	Mean	SD
Risk assessment should be strengthened during project planning	0 (0.0%)	2 (2.5%)	4 (5.0%)	24 (30.0%)	50 (62.5%)	4.52	0.65
Construction contracts should clearly define risk responsibilities	0 (0.0%)	1 (1.3%)	3 (3.7%)	23 (28.7%)	53 (66.3%)	4.60	0.58
Stakeholder participation should be strengthened during contract development	1 (1.3%)	2 (2.5%)	5 (6.2%)	31 (38.8%)	41 (51.2%)	4.38	0.71
Training should be provided to improve risk management capacity	0 (0.0%)	2 (2.5%)	4 (5.0%)	30 (37.5%)	44 (55.0%)	4.45	0.68
Monitoring systems for road construction projects should be strengthened	0 (0.0%)	1 (1.3%)	4 (5.0%)	30 (37.5%)	45 (56.2%)	4.49	0.63
Improved supervision mechanisms can enhance risk mitigation	1 (1.3%)	2 (2.5%)	5 (6.2%)	28 (35.0%)	44 (55.0%)	4.42	0.70
Adoption of modern risk management tools can improve project performance	1 (1.3%)	2 (2.5%)	6 (7.5%)	27 (33.7%)	44 (55.0%)	4.40	0.69
Strengthening institutional capacity can improve infrastructure project outcomes	0 (0.0%)	1 (1.3%)	3 (3.7%)	28 (35.0%)	48 (60.0%)	4.54	0.61
Aggregate Mean						4.48	0.66

The findings presented in Table 12 indicate overwhelming support for interventions aimed at strengthening risk allocation and risk mitigation practices in public road construction projects within the Elgon Region. The aggregate mean score of 4.48 (SD = 0.66) demonstrates a remarkably high level of consensus among respondents regarding the reforms required to improve project risk management. This finding is noteworthy because it suggests that stakeholders do not merely recognize the challenges affecting risk management but also possess relatively clear views regarding the interventions required to address those challenges.

The strength of support for all proposed recommendations is particularly significant when considered alongside the findings presented in the preceding sections. Respondents identified political influence, delayed decision-making, institutional weaknesses, funding constraints, environmental uncertainty, inadequate monitoring, and limited technical capacity as major obstacles affecting risk allocation and mitigation. The recommendations therefore appear to represent direct responses to the challenges experienced by practitioners during project implementation. This finding is consistent with adaptive risk management theory, which suggests that effective risk management systems evolve through learning from previous project experiences and institutional shortcomings (Hillson & Simon, 2020).

The most highly rated recommendation was that construction contracts should clearly define risk responsibilities (Mean = 4.60, SD = 0.58), with 95.0 percent of respondents either agreeing or strongly agreeing with the recommendation. This finding is particularly important because it mirrors earlier findings in which unclear contractual provisions were identified as a major challenge affecting effective risk allocation. The result suggests that respondents perceive contractual ambiguity as one of the root causes of many project disputes, delays, and accountability challenges.

The finding aligns closely with Contract Theory, which argues that clearly specifying obligations and responsibilities improves coordination, accountability, and performance outcomes (Hart & Holmström, 2017). Similarly, FIDIC contract principles emphasize that effective risk management depends on assigning risks to parties best able to manage them and ensuring that those responsibilities are clearly documented. Previous studies by El-Sayegh et al. (2022) and Luo and Chen (2024) likewise found that contractual clarity significantly improves project performance by reducing uncertainty and minimizing disputes among stakeholders.

One Project Manager explained:

“The first step should be ensuring that contracts clearly specify who is responsible for each risk. Many of the disputes we experience are not necessarily because stakeholders disagree about the importance of managing risks. The problem is that responsibilities are sometimes interpreted differently once challenges emerge. If contracts clearly define risk

ownership from the beginning, there is less room for misunderstanding and project teams can focus on solving problems rather than debating responsibility.”

However, another respondent suggested that contractual clarity alone may not be sufficient:

“Clear contracts are important, but even the best contract cannot anticipate every situation. Road projects operate in changing environments and new risks emerge during implementation. The challenge is not only writing better contracts but also ensuring that institutions have the flexibility and capacity to respond when circumstances change.”

This observation is important because it highlights a recurring theme throughout the study. While respondents strongly support contractual reforms, they also recognize that effective risk management requires more than contractual provisions alone.

Strengthening institutional capacity emerged as the second highest-rated recommendation (Mean = 4.54, SD = 0.61). This finding is consistent with earlier results where institutional weaknesses and capacity constraints were identified as major obstacles affecting both risk allocation and risk mitigation. The finding suggests that respondents perceive institutional effectiveness as fundamental to successful risk management. In other words, even well-designed contracts and risk management frameworks may fail if the institutions responsible for implementing them lack the necessary resources, expertise, and organizational systems.

The finding is consistent with Institutional Theory, which emphasizes that organizational performance depends not only on formal rules and procedures but also on the capacity of institutions to implement them effectively (Scott, 2014). Similarly, the World Bank (2020) identifies institutional capacity as one of the most important determinants of infrastructure project success in developing countries.

A District Engineer explained:

“Capacity building is essential because many local institutions are expected to manage increasingly complex projects with limited resources. We need more qualified technical staff, better equipment, stronger organizational systems, and continuous professional development. Without strengthening institutional capacity, many of the recommendations being proposed will be difficult to implement effectively.”

Nevertheless, a Contract Manager offered a slightly different perspective:

“Capacity is important, but institutions do not operate in isolation. There are situations where institutions have competent staff but are constrained by funding shortages, political interference, or administrative procedures. Strengthening capacity should therefore be accompanied by broader governance reforms.”

This finding suggests that respondents view institutional strengthening as necessary but not sufficient on its own.

Respondents also strongly supported strengthening risk assessment during project planning (Mean = 4.52, SD = 0.65). This recommendation is particularly interesting because risk assessment received the lowest rating among the risk mitigation measures examined earlier in the study. The finding suggests that stakeholders believe many project challenges originate during the planning stage when important risks are either overlooked or underestimated.

The finding supports Flyvbjerg’s (2023) argument that the quality of front-end planning often determines the success or failure of infrastructure projects. Similarly, PMI (2021) emphasizes that effective risk management begins with comprehensive identification and analysis of risks before implementation commences. The strong support for strengthening risk assessment therefore suggests that respondents perceive prevention as more effective than responding to problems after they have already materialized.

A Resident Engineer observed:

“Risk assessments need to be conducted more thoroughly during project planning. Some projects begin before all critical risks have been properly identified. Technical risks usually receive attention, but environmental, financial, stakeholder-related, and institutional risks are sometimes underestimated. By the time these issues emerge during implementation, the cost of addressing them is much higher.”

The findings further indicate strong support for strengthening monitoring systems for road construction projects (Mean = 4.49, SD = 0.63). This recommendation directly reflects earlier findings where weak monitoring systems were identified as a major obstacle affecting implementation of mitigation measures. The finding suggests that respondents view monitoring as

an essential mechanism for ensuring that risk management remains effective throughout the project lifecycle.

According to PMI (2021), risk management is a continuous process that requires ongoing monitoring, evaluation, and adjustment. Similarly, Ochieng et al. (2020) found that effective monitoring enables project teams to identify emerging threats and evaluate whether mitigation measures are achieving their intended objectives.

One Contract Manager stated:

“Risk management does not end once mitigation measures have been identified. Project conditions change continuously and risks evolve throughout implementation. Strong monitoring systems help project teams identify emerging challenges early enough to take corrective action before the situation becomes critical.”

However, another respondent warned that monitoring systems can become overly bureaucratic:

“Monitoring is important, but there is a risk of creating systems that generate large amounts of information without necessarily improving decision-making. Monitoring should be practical and focused on supporting timely action rather than simply producing reports.”

Training to improve risk management capacity also received substantial support (Mean = 4.45, SD = 0.68). This finding highlights the importance respondents place on human capital development as a means of strengthening project performance. The recommendation reflects earlier findings indicating that inadequate technical expertise and contract management skills hinder effective risk management.

The finding aligns with Human Capital Theory, which argues that investment in knowledge and skills improves organizational performance and productivity. Previous studies by El-Sayegh et al. (2022) similarly found that specialized training significantly enhances the quality of risk identification, assessment, allocation, and mitigation.

One District Engineer explained:

“Risk management is becoming increasingly specialized. Engineers, procurement officers, environmental specialists, and project managers require continuous training because the challenges affecting projects are becoming more complex. Without ongoing professional development, it becomes difficult to keep pace with changing technologies, environmental risks, and contractual requirements.”

Improved supervision mechanisms were also strongly supported (Mean = 4.42, SD = 0.70). This finding is consistent with earlier results showing that supervision plays an important role in minimizing project risks. Effective supervision enables project teams to identify emerging issues, verify compliance with project requirements, and implement corrective actions before risks escalate.

Similarly, respondents strongly supported adoption of modern risk management tools (Mean = 4.40, SD = 0.69). This recommendation reflects concerns expressed earlier regarding the limited availability of advanced technologies and analytical tools for risk management. Respondents appear to recognize that increasingly complex infrastructure projects require more sophisticated approaches to risk identification, forecasting, monitoring, and decision-making.

A Contract Manager observed:

“Technology can significantly improve risk management. Digital monitoring systems, geospatial technologies, forecasting tools, and project management software allow project teams to identify problems much earlier than traditional approaches. The challenge is ensuring that institutions have the resources and skills required to use these technologies effectively.”

However, another respondent cautioned against relying too heavily on technology:

“Technology is useful, but it should complement rather than replace professional judgment. Some risks require local knowledge and practical experience that cannot always be captured by software systems.”

Stakeholder participation received the lowest mean score among the recommendations (Mean = 4.38, SD = 0.71). Although this was the lowest-ranked recommendation, the score still indicates very strong support. The finding is particularly interesting because poor stakeholder coordination

was identified as a significant challenge in earlier sections. This suggests that respondents recognize the value of stakeholder participation but may perceive other interventions such as contractual reforms, institutional strengthening, and improved planning as more urgent priorities.

The finding supports Stakeholder Theory (Freeman, 2010), which argues that involving stakeholders in decision-making improves project legitimacy, information sharing, and commitment to implementation outcomes.

One key informant remarked:

“Stakeholder involvement should start during project planning rather than after contracts have already been finalized. Contractors, local governments, technical teams, and affected communities often possess valuable information about potential risks. Bringing them into the process earlier would improve both risk identification and stakeholder commitment to mitigation measures.”

Interestingly, the relatively lower ranking of stakeholder participation may suggest that respondents view participation as an enabling factor rather than a primary driver of risk management performance. In contrast, contractual clarity, institutional capacity, and planning processes appear to be viewed as more fundamental prerequisites for effective risk management.

Overall, the findings indicate that respondents strongly support comprehensive reforms aimed at strengthening contractual clarity, institutional capacity, risk assessment, monitoring systems, professional competencies, supervision mechanisms, stakeholder engagement, and technological innovation. The exceptionally high level of agreement across all recommendations suggests that stakeholders possess a shared understanding of both the challenges affecting project risk management and the interventions required to address them. More importantly, the findings demonstrate that respondents view effective risk management as a multidimensional process requiring simultaneous improvements in governance, institutions, technical capacity, planning, monitoring, and stakeholder collaboration rather than reliance on any single intervention.

4.9 Chapter Summary

This chapter presented and discussed the findings on risk allocation and risk mitigation practices in public road construction projects in the Elgon Region of Uganda. Overall, the findings suggest

that while risk management practices are generally perceived as effective, their effectiveness is constrained by institutional, governance, financial, and environmental factors that limit their implementation in practice.

A key pattern emerging from the findings is the distinction between the existence of risk management mechanisms and their actual implementation. Respondents generally agreed that risk allocation practices contribute positively to project performance, timely project completion, and reduction of disputes. Similarly, risk mitigation strategies such as geotechnical investigations, contingency planning, supervision mechanisms, and environmental management measures were viewed as important contributors to project success. These findings indicate that stakeholders understand the value of risk management and recognize its contribution to improving project outcomes.

However, the findings also revealed a recurring tension between theory and practice. Although risk allocation and mitigation mechanisms are widely used, respondents reported significant challenges that undermine their effectiveness. Political influence emerged as the most significant challenge affecting risk allocation, suggesting that risk management decisions are not always guided solely by technical considerations. Instead, broader governance dynamics appear to shape how risks are distributed and managed. Likewise, delayed government funding was identified as the most significant obstacle affecting implementation of mitigation measures, indicating that the success of risk management interventions depends not only on technical planning but also on the availability of financial resources and institutional support.

Another important pattern relates to the role of institutional capacity. Across all objectives, respondents consistently highlighted institutional weaknesses, inadequate technical expertise, weak monitoring systems, limited access to risk management tools, and poor coordination among stakeholders as barriers to effective risk management. This finding suggests that the effectiveness of risk allocation and mitigation practices is influenced less by the availability of risk management frameworks and more by the capacity of institutions to implement them. In this regard, the study demonstrates that effective risk management is ultimately an institutional challenge as much as it is a technical one.

The findings also reveal the distinctive influence of the environmental context within which road projects are implemented. Environmental uncertainties, including landslides, unstable slopes, soil erosion, and unpredictable rainfall patterns, emerged repeatedly throughout the study. While geotechnical investigations received the highest rating among mitigation strategies, environmental risks received comparatively lower ratings under risk allocation practices and remained one of the most significant challenges affecting implementation of mitigation measures. This suggests that although stakeholders have developed mechanisms for managing environmental risks, the dynamic and unpredictable nature of the Elgon Region continues to present challenges that cannot be fully eliminated through conventional risk management approaches.

Perhaps the most significant finding emerging from the study is that respondents overwhelmingly supported reforms aimed at strengthening contractual clarity, institutional capacity, risk assessment, monitoring systems, professional competencies, supervision mechanisms, stakeholder engagement, and technological innovation. The exceptionally high levels of agreement across these recommendations suggest a shared recognition among stakeholders that improvements in risk management require systemic rather than isolated interventions. Effective management of project risks cannot be achieved through contractual reforms alone, technological solutions alone, or capacity-building initiatives alone. Rather, it requires a coordinated approach that addresses governance structures, institutional capabilities, planning processes, stakeholder relationships, and implementation systems simultaneously.

Taken together, the findings suggest that public road construction projects in the Elgon Region have established important foundations for risk allocation and mitigation, but significant gaps remain between policy intentions and implementation realities. The chapter therefore highlights the need for more integrated and institutionally grounded approaches to project risk management. These findings provide the basis for the conclusions, recommendations, and policy implications presented in Chapter Five, where the study interprets the broader significance of the results and proposes strategies for strengthening risk management practices in public road construction projects.

CHAPTER FIVE: SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, discussion of findings, conclusions, recommendations, contributions of the study, limitations of the study, and recommendations for future research. The chapter discusses the findings in relation to the study objectives, existing literature, and the theoretical frameworks that guided the study, namely Risk Management Theory and Contract Theory. The discussion focuses on the effectiveness of risk allocation practices, challenges affecting effective risk allocation, effectiveness of risk mitigation strategies, challenges hindering implementation of risk mitigation strategies, and measures for improving risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda.

The purpose of the discussion is not merely to restate the findings but to explain their implications for infrastructure project management, contract administration, and risk governance within Uganda's road construction sector. The chapter therefore provides a critical interpretation of the findings and demonstrates how they contribute to understanding risk management practices within public infrastructure projects.

5.2 Summary of Findings

The study examined risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda. Overall, the findings indicate that stakeholders generally perceive existing risk management mechanisms as valuable and necessary for improving project performance. Risk allocation practices were viewed as important for enhancing accountability, reducing disputes, clarifying responsibilities, and supporting project implementation, while risk mitigation measures were perceived as contributing to improved infrastructure quality, cost control, and project delivery. These findings suggest that public road construction projects in the region have established formal systems and procedures for managing project risks and that stakeholders recognize the contribution of these mechanisms to project success.

However, a more significant finding emerging from the study is the apparent coexistence of effective risk management practices and substantial implementation challenges. Across all study

objectives, respondents consistently acknowledged the benefits of risk allocation and mitigation measures while simultaneously reporting serious constraints affecting their application in practice. Political influence, delayed decision-making, institutional weaknesses, funding constraints, environmental uncertainty, weak monitoring systems, limited technical expertise, and poor stakeholder coordination emerged as persistent challenges. This pattern suggests that the primary problem facing public road construction projects in the Elgon Region is not the absence of risk management frameworks but the difficulty of implementing them effectively within complex institutional, financial, and environmental contexts.

The findings further reveal that governance and institutional capacity are central determinants of risk management effectiveness. While technical measures such as geotechnical investigations, contingency planning, supervision, and environmental management were widely supported, stakeholders repeatedly emphasized that their success depends on the availability of adequate resources, competent personnel, effective institutions, and timely decision-making processes. The prominence of political influence as the most significant challenge affecting risk allocation and delayed government funding as the most significant challenge affecting risk mitigation implementation demonstrates that project risk management is influenced as much by governance systems and organizational capacity as by technical considerations.

Another important pattern concerns the growing significance of environmental risk within road construction projects in the Elgon Region. Environmental risks emerged repeatedly throughout the study, both as a challenge affecting risk allocation and as a major obstacle to implementation of mitigation measures. At the same time, geotechnical investigations were identified as the most effective mitigation strategy. This suggests that stakeholders increasingly recognize the importance of environmental and geotechnical considerations, yet continue to face difficulties managing the unpredictable effects of landslides, unstable slopes, soil erosion, and changing rainfall patterns. Consequently, environmental risk management remains one of the most critical areas requiring attention in future road construction projects.

Finally, the findings demonstrate strong stakeholder consensus regarding the reforms required to improve project risk management. Respondents consistently emphasized the need for greater contractual clarity, stronger institutional capacity, improved risk assessment and monitoring

systems, enhanced technical competencies, adoption of modern risk management tools, and broader stakeholder participation. Collectively, these findings suggest that improving risk management in public road construction projects requires a holistic approach that addresses governance structures, institutional capabilities, technical systems, and implementation processes simultaneously. The findings therefore provide a foundation for understanding how risk management practices can be strengthened to improve project performance and infrastructure resilience in the Elgon Region.

5.3 Discussion of Findings

5.3.1 Effectiveness of Risk Allocation Practices in Public Road Construction Projects

The first objective of the study sought to assess the effectiveness of risk allocation practices in public road construction projects in the Elgon Region of Uganda. The findings revealed that respondents generally perceived risk allocation practices as effective in improving project performance, facilitating timely project completion, reducing disputes among stakeholders, and enhancing accountability during project implementation. These findings suggest that stakeholders recognize risk allocation as an important governance mechanism through which responsibilities are clarified and project uncertainties are managed.

The findings revealed that effective risk allocation contributes positively to project performance. This suggests that assigning risks to parties with the technical expertise, resources, and authority to manage them enables projects to respond more effectively to emerging challenges. These findings are consistent with those of El-Sayegh et al. (2022), who found that construction projects characterized by clearly defined risk ownership generally achieve better performance outcomes because project participants understand their responsibilities and can respond more effectively when risks materialize. Similarly, Yescombe (2018) reported that infrastructure projects perform better when risks are allocated to the parties best able to control them. The similarity between these findings may be attributed to the nature of construction projects, which involve multiple stakeholders whose actions are interdependent and therefore require clearly defined responsibilities to ensure effective coordination.

The findings also agree with Liu, Zhao, and Wang (2021), who found that risk allocation improves project efficiency by reducing uncertainty and strengthening accountability mechanisms among project actors. Likewise, Chileshe and Kikwasi (2023) reported that effective risk allocation contributes to improved infrastructure performance in developing countries because it creates greater clarity regarding decision-making responsibilities. Collectively, these studies support the argument that effective risk allocation remains a fundamental requirement for successful project delivery regardless of geographical context.

However, the findings differ from those reported by Loosemore and Cheung (2015), who observed that in some infrastructure projects risk allocation alone does not necessarily improve project performance because external institutional and political factors often override contractual arrangements. While respondents in the current study generally associated risk allocation with positive project outcomes, they simultaneously reported significant governance and institutional challenges affecting implementation. This difference may be explained by the fact that the current study evaluated stakeholders' perceptions of the effectiveness of risk allocation mechanisms, whereas Loosemore and Cheung focused on the broader institutional environment within which those mechanisms operate. The findings therefore suggest that risk allocation can be perceived as effective even when implementation challenges continue to exist.

The findings further revealed that effective risk allocation contributes to timely completion of road construction projects. This suggests that clear assignment of responsibilities enables project stakeholders to take corrective action more quickly when risks emerge. These findings agree with Flyvbjerg (2023), who argues that uncertainty regarding risk ownership frequently contributes to project delays because stakeholders spend considerable time determining responsibility once problems occur. Similarly, Hillson and Simon (2020) found that projects characterized by clear accountability structures generally experience fewer implementation delays because decision-making processes are simplified.

However, the findings differ from those reported by Love et al. (2022), who found that clear risk allocation does not always guarantee timely project completion because delays may arise from factors beyond the control of project stakeholders, including regulatory constraints, political decisions, and funding disruptions. This observation is particularly relevant to the present study

because respondents simultaneously identified delayed decision-making and political influence as major challenges affecting risk allocation. Consequently, while risk allocation appears to facilitate timely implementation, its effectiveness may still be constrained by broader institutional realities.

Another important finding was that effective risk allocation reduces disputes among project stakeholders. This suggests that clearly defining responsibilities reduces misunderstandings and strengthens accountability during project implementation. These findings agree with Ochieng et al. (2020), who found that contractual disputes frequently arise when responsibilities for managing project risks are poorly defined. Similarly, PMI (2021) reported that effective risk allocation improves stakeholder relationships by establishing clear expectations regarding risk ownership and accountability.

The findings also support the observations of El-Sayegh et al. (2022), who found that disputes in construction projects are often linked to ambiguity regarding contractual responsibilities. The agreement between these studies and the current findings may be explained by the contractual nature of construction projects, where multiple actors are required to work together under clearly defined obligations. Where risk ownership is unclear, disputes become more likely because stakeholders may interpret responsibilities differently.

Despite these positive findings, environmental risks received comparatively lower ratings than other dimensions of risk allocation. This suggests that stakeholders perceive environmental risks as more difficult to allocate effectively than technical or contractual risks. These findings differ from traditional risk allocation literature, particularly the work of Yescombe (2018), which assumes that most project risks can be allocated to specific stakeholders according to their expertise and contractual responsibilities. The findings suggest that environmental risks may not fit neatly within conventional contractual allocation models because they are often influenced by external factors beyond the control of individual stakeholders.

Instead, the findings agree more closely with recent studies by Flyvbjerg (2023), Aven (2021), and Nguyen et al. (2023), who argue that environmental and climate-related risks increasingly challenge traditional approaches to risk allocation. These scholars contend that risks associated with climate variability, extreme weather events, and environmental degradation are often

systemic in nature and therefore difficult to assign to a single responsible party. The agreement may be explained by the environmental conditions of the Elgon Region, which is characterized by landslides, unstable slopes, erosion, and increasingly unpredictable rainfall patterns. Such risks often affect multiple stakeholders simultaneously and may require collaborative rather than purely contractual approaches to risk management.

One of the most important findings emerging from this study is that respondents perceived risk allocation practices as effective while simultaneously identifying significant challenges affecting effective risk allocation. At first glance, this appears contradictory. However, the findings suggest that respondents were evaluating two different dimensions of risk allocation. On one hand, they acknowledged that risk allocation mechanisms contribute positively to project performance. On the other hand, they recognized that political influence, institutional weaknesses, delayed decision-making, and contractual ambiguities frequently undermine the implementation of those mechanisms.

This finding agrees with Scott's (2014) Institutional Theory, which argues that organizations may possess effective formal structures while still experiencing implementation challenges due to institutional constraints. Similarly, Flyvbjerg (2023) observed that many infrastructure projects fail not because risk management systems are absent but because governance systems struggle to implement technically sound solutions effectively. The findings therefore suggest that the primary challenge facing public road construction projects in the Elgon Region is not the absence of risk allocation frameworks but the gap between their design and their practical execution.

The findings provide partial support for Contract Theory as developed by Coase (1937) and later expanded by Williamson (1985). The theory assumes that risks should be allocated to the party best able to manage them in order to reduce transaction costs and improve project efficiency. The finding that technical risks are generally allocated to stakeholders possessing relevant expertise supports this assumption. Similar findings were reported by Hart and Holmström (2017), El-Sayegh et al. (2022), and Liu et al. (2021), all of whom concluded that project performance improves when risks are assigned according to technical competence.

However, the findings also challenge important assumptions of Contract Theory. Political influence emerged as the most significant challenge affecting effective risk allocation, suggesting that risk allocation decisions are not always guided by technical capability or economic efficiency. This finding contradicts the rational assumptions underpinning Contract Theory and suggests that political and institutional considerations may sometimes override contractual principles. Consequently, the study does not reject Contract Theory but rather qualifies its applicability within public infrastructure projects. The findings suggest that while the theory explains how risks should be allocated under ideal conditions, it is less effective in explaining how risks are actually allocated within politically and institutionally complex public-sector environments.

Overall, the findings demonstrate that risk allocation practices contribute positively to project performance in public road construction projects within the Elgon Region. Nevertheless, their effectiveness is moderated by political, institutional, contractual, and environmental factors that influence how risk allocation frameworks operate in practice. The findings therefore suggest that improving project performance requires not only stronger contractual arrangements but also governance and institutional reforms capable of supporting their effective implementation.

5.3.2 Challenges Affecting Effective Risk Allocation in Public Road Construction Projects

The second objective sought to examine the challenges affecting effective risk allocation in public road construction projects in the Elgon Region. The findings revealed that political influence, delayed decision-making, institutional weaknesses, unclear contractual provisions, inadequate contract management skills, limited institutional capacity, and insufficient stakeholder participation continue to undermine effective risk allocation. These findings suggest that the barriers to effective risk allocation are largely institutional and governance-related rather than purely technical in nature.

One of the most significant findings was that political influence emerged as the highest-rated challenge affecting effective risk allocation. This finding suggests that risk allocation decisions are not always based on technical assessments, contractual obligations, or project management principles. Rather, external political interests appear to influence how risks and responsibilities are distributed among project stakeholders. These findings agree with Flyvbjerg (2023), who found

that political pressures frequently distort infrastructure decision-making processes and often result in inefficient project outcomes. Similarly, Ochieng et al. (2020) reported that political interference remains a major challenge affecting infrastructure governance in many developing countries. The World Bank (2021) also observed that infrastructure projects operating within politically charged environments often experience deviations from technically optimal decisions due to external pressures from political actors.

The findings further support the observations of Muriithi and Crawford (2022), who found that political considerations frequently influence project prioritization, procurement decisions, and contract administration in public infrastructure projects. The agreement among these studies may be explained by the public nature of road construction projects, which often attract political attention because of their visibility and significance to local communities.

However, the findings differ from those reported by Hart and Holmström (2017), whose work assumes that contractual decisions are largely guided by efficiency considerations and rational decision-making processes. The findings from the present study suggest that political realities may override these assumptions in public-sector projects. This difference may be explained by contextual variations between developed institutional environments and public infrastructure systems in developing countries, where political actors often play a more direct role in project implementation. Consequently, the findings suggest that political influence remains one of the major factors limiting the practical application of rational risk allocation principles.

The findings also revealed that delayed decision-making significantly affects effective risk allocation. This suggests that bureaucratic procedures and lengthy approval processes reduce the ability of project stakeholders to respond promptly to emerging risks. These findings agree with Hillson and Simon (2020), who found that delays in decision-making often increase both the likelihood and impact of project risks because opportunities for early intervention are lost. Similarly, PMI (2021) reported that effective risk management requires timely decisions throughout the project lifecycle to prevent minor challenges from developing into major project disruptions.

However, the findings differ slightly from those reported by Kerzner (2022), who argues that formal approval systems can sometimes improve project outcomes by ensuring that decisions are subjected to adequate scrutiny before implementation. While respondents in the current study acknowledged the importance of accountability, they largely perceived existing approval processes as excessively slow and bureaucratic. This suggests that although oversight mechanisms are necessary, excessive procedural requirements may reduce project responsiveness and increase uncertainty.

Institutional weaknesses also emerged as a major challenge affecting effective risk allocation. This finding suggests that the effectiveness of risk allocation depends not only on contractual arrangements but also on the strength of the institutions responsible for implementing them. These findings agree with the African Development Bank (2021), which identified institutional capacity deficiencies as a major cause of poor infrastructure project performance across Africa. Similarly, Scott (2014) argues that formal systems derive their effectiveness from the institutional environments within which they operate. The findings also support those of Locatelli et al. (2023), who found that strong institutional arrangements improve coordination, accountability, and project governance.

However, the findings differ from studies that primarily attribute project failures to technical deficiencies. For example, earlier engineering-focused studies emphasized technical planning and design limitations as the primary determinants of project outcomes. In contrast, the current findings suggest that institutional factors may be equally important, if not more important, than technical considerations in determining the effectiveness of risk allocation. This difference may reflect growing recognition within contemporary infrastructure literature that governance and institutional quality play central roles in project success.

The findings further revealed that unclear contractual provisions continue to affect effective risk allocation. These findings agree with Yescombe (2018), who found that poorly drafted contracts remain one of the leading causes of disputes and ineffective risk management in infrastructure projects. Similarly, El-Sayegh et al. (2022) reported that contractual ambiguity frequently creates uncertainty regarding responsibility for managing project risks. The agreement may be explained

by the fact that construction projects frequently encounter unforeseen circumstances that require stakeholders to interpret contractual provisions under pressure.

However, respondents also indicated that contractual clarity alone does not necessarily guarantee effective risk allocation. Even where contracts define responsibilities, disputes may still arise because stakeholders interpret provisions differently once risks materialize. This finding differs from studies that portray contractual clarity as a sufficient condition for effective risk management. The findings therefore suggest that contract administration and stakeholder communication are equally important in ensuring effective risk allocation.

The findings also identified inadequate contract management skills as a significant challenge. This finding suggests that successful risk allocation requires specialized competencies beyond technical engineering knowledge. These findings agree with PMI (2021), Hillson and Simon (2020), and Love et al. (2022), all of whom emphasize the importance of professional competence in project risk management. The agreement may be explained by the increasing complexity of modern construction projects, which require project managers to possess expertise in contracts, stakeholder management, risk analysis, and governance.

Similarly, limited institutional capacity was identified as a major challenge affecting effective risk allocation. These findings agree with Ochieng et al. (2020) and the African Development Bank (2021), who found that shortages of skilled personnel, technical resources, and organizational systems frequently undermine project performance. However, the findings also suggest that institutional capacity extends beyond staffing levels and financial resources. Respondents repeatedly highlighted the importance of leadership, coordination mechanisms, and organizational culture. This broader understanding of institutional capacity differs from studies that focus primarily on human resource shortages as the main determinant of organizational effectiveness.

The findings further revealed that lack of stakeholder participation affects effective risk allocation. These findings agree with Freeman's Stakeholder Theory (1984), which argues that effective decision-making requires the involvement of all relevant stakeholders because different actors possess different forms of knowledge and expertise. Similarly, PMI (2021) found that stakeholder engagement improves risk identification and project governance. However, the findings differ

from traditional top-down project management approaches that place primary responsibility for decision-making within central government agencies. The evidence from the current study suggests that excluding local stakeholders, contractors, and consultants may limit the comprehensiveness of risk identification and allocation processes.

An important issue emerging from these findings is the apparent contradiction between the perceived effectiveness of risk allocation practices and the substantial challenges affecting their implementation. At first glance, these findings appear inconsistent. However, the evidence suggests that respondents distinguished between the effectiveness of risk allocation mechanisms and the realities of implementing those mechanisms within public-sector environments. Stakeholders appear to believe that risk allocation frameworks contribute positively to project performance while simultaneously recognizing that governance and institutional constraints frequently prevent those frameworks from functioning optimally.

This observation agrees with Scott (2014), who argues that organizations may possess effective formal systems while still experiencing implementation difficulties due to institutional constraints. Similarly, Flyvbjerg (2023) notes that infrastructure projects often fail not because appropriate systems are absent but because institutions struggle to implement them effectively. The findings therefore suggest that the primary challenge facing public road construction projects in the Elgon Region is not the absence of risk allocation mechanisms but the gap between their design and their execution.

The findings provide an important qualification to Contract Theory as developed by Coase (1937) and Williamson (1985). While the theory assumes that risks should be allocated rationally to the party best able to manage them, the prominence of political influence, institutional weaknesses, and governance challenges suggests that risk allocation decisions are often shaped by factors extending beyond contractual efficiency. The findings therefore extend Contract Theory by demonstrating that risk allocation in public infrastructure projects is influenced not only by contractual considerations but also by political, institutional, and governance realities.

Overall, the findings demonstrate that challenges affecting risk allocation are predominantly governance and institutional challenges rather than technical challenges. Political influence,

delayed decision-making, institutional weaknesses, contractual ambiguities, and capacity constraints emerged as the most significant barriers. The findings therefore suggest that improving risk allocation requires not only contractual reforms but also broader improvements in governance systems, institutional capacity, and stakeholder engagement.

5.3.3 Effectiveness of Risk Mitigation Strategies in Public Road Construction Projects

The third objective of the study sought to assess the effectiveness of risk mitigation strategies in public road construction projects in the Elgon Region of Uganda. The findings revealed that respondents generally perceived risk mitigation strategies as effective in improving project performance, enhancing infrastructure quality, reducing project delays, controlling costs, and minimizing environmental and technical risks. These findings suggest that stakeholders recognize risk mitigation as a critical component of project management and acknowledge its contribution to improving the performance of road construction projects operating within complex and uncertain environments.

The study revealed that geotechnical investigations were perceived as the most effective risk mitigation strategy. This finding suggests that stakeholders consider a comprehensive understanding of site conditions essential for reducing uncertainty and supporting informed project decision-making. The finding agrees with El-Sayegh et al. (2022), who found that detailed site investigations improve project performance by reducing technical uncertainty and minimizing costly design changes during implementation. Similarly, Flyvbjerg (2023) argues that inadequate understanding of project environments remains one of the principal causes of infrastructure project failure globally. Locatelli et al. (2023) likewise found that infrastructure projects operating in geologically sensitive areas achieve better outcomes when substantial investments are made in pre-construction investigations.

The agreement between these studies and the current findings may be explained by the geographical characteristics of the Elgon Region, where road projects are frequently affected by unstable slopes, landslides, erosion, and difficult terrain. Under such conditions, geotechnical investigations provide critical information for route selection, pavement design, slope

stabilization, and drainage planning. Consequently, stakeholders perceive such investigations as a necessary first step in reducing project uncertainty.

However, the findings also differ from the deterministic assumptions reflected in the work of Merna and Al-Thani (2018) and aspects of PMBOK-based risk management approaches (PMI, 2021), which imply that comprehensive site investigations substantially reduce project uncertainty and improve predictability. Although respondents strongly supported geotechnical investigations, environmental risks continued to emerge as significant challenges throughout the study. Respondents acknowledged that projects still experienced slope failures, flooding, erosion, and landslides despite extensive site investigations. The difference may be explained by increasing climate variability and environmental unpredictability in the Elgon Region. The findings therefore suggest that geotechnical investigations improve preparedness and reduce uncertainty but cannot completely eliminate environmental risks.

This finding also qualifies Risk Management Theory as advanced by Hillson (2002) and later refined by Hillson and Simon (2020). While the theory assumes that improved information leads to better risk management decisions, the findings suggest that some environmental risks remain inherently uncertain even when extensive information is available. Consequently, risk management should be viewed as a process of reducing uncertainty and strengthening resilience rather than achieving complete predictability.

The findings further revealed that risk mitigation strategies contribute significantly to infrastructure quality. This suggests that proactive management of project risks enables stakeholders to maintain technical standards and reduce defects during construction. The finding agrees with Wang and Chou (2020), who found that projects characterized by strong risk management systems generally achieve superior quality outcomes because threats to performance are addressed before they affect project deliverables. Similarly, Kerzner (2022) argues that many quality failures in infrastructure projects originate from unmanaged risks rather than technical incompetence alone. Love et al. (2022) likewise reported that risk management contributes to long-term infrastructure reliability by minimizing the occurrence of avoidable project disruptions.

However, the findings differ from those reported by Kerzner (2022) and PMI (2021), who largely present risk management as a primary determinant of project success and quality performance. In the current study, respondents repeatedly emphasized that project quality is also influenced by contractor competence, adequacy of supervision, availability of construction materials, funding availability, and institutional support. This suggests that while risk mitigation contributes significantly to quality outcomes, it operates alongside other project management factors. The difference may be explained by the context of public infrastructure projects in developing countries, where institutional and resource constraints frequently influence project performance. The findings therefore indicate that risk mitigation is an important contributor to quality but not the sole determinant of infrastructure success.

The findings also revealed that contingency planning was widely perceived as an effective strategy for managing project risks. This suggests that stakeholders value preparedness and flexibility when dealing with uncertainty. The finding agrees with PMI (2021), which identifies contingency planning as an essential component of project resilience. Similarly, Hillson and Simon (2020) found that organizations with well-developed contingency arrangements respond more effectively to unexpected project disruptions. Zhang et al. (2023) likewise reported that infrastructure projects characterized by strong contingency planning recover more quickly from unforeseen events than projects relying exclusively on reactive management approaches.

Nevertheless, the findings differ from the assumptions of Hillson and Simon (2020) regarding the practical application of contingency planning. While respondents acknowledged the importance of contingency plans, qualitative findings revealed that many contingency measures are prepared during project planning but are not regularly reviewed or updated during implementation. Consequently, the effectiveness of contingency planning appears to depend not only on the existence of contingency measures but also on their continuous application throughout the project lifecycle. This finding suggests that implementation remains a critical challenge even where mitigation frameworks are formally established.

Project supervision also emerged as an important risk mitigation mechanism. The findings suggest that regular monitoring enables project teams to identify emerging problems before they escalate into major challenges. These findings agree with Ochieng et al. (2020), who found that effective

supervision improves project performance by facilitating early identification of technical and operational risks. Similarly, Love et al. (2022) argue that continuous monitoring enables project managers to detect weak signals of project failure before they become significant disruptions. PMI (2021) likewise identifies supervision as a critical element of project governance and risk management.

However, the findings differ from those reported by Love et al. (2022), whose study assumes that supervision systems generally operate within adequately resourced institutional environments. Respondents in the current study highlighted shortages of technical personnel, transport, equipment, and financial resources that often limit the effectiveness of supervision activities. The difference may be explained by contextual variations between developed project environments and public infrastructure projects in developing countries. The findings therefore suggest that the effectiveness of supervision depends not only on monitoring systems but also on the institutional capacity required to support those systems.

The study further revealed that risk mitigation measures contribute to project cost control and reduction of delays. These findings agree with Flyvbjerg (2023), who found that unmanaged risks remain among the leading causes of cost overruns and schedule slippages in infrastructure projects. Similarly, Locatelli et al. (2023) reported that proactive risk management improves predictability in project costs and implementation schedules. The agreement may be explained by the fact that effective mitigation measures reduce disruptions that often generate additional expenditure and implementation delays.

However, the findings differ from studies that imply that effective mitigation should substantially eliminate project delays and cost overruns. For example, PMI (2021) and Kerzner (2022) largely emphasize the capacity of risk management to improve project control and performance. In contrast, respondents in the current study indicated that projects continue to experience delays arising from funding constraints, political decisions, land acquisition disputes, and extreme weather events despite the existence of mitigation measures. This finding aligns more closely with the resilience perspective advanced by Aven (2021) and Linkov and Trump (2019), which argues that risk management should focus on improving adaptive capacity rather than attempting to eliminate disruptions entirely.

Environmental management plans were also perceived as effective in reducing environmental risks during project implementation. This finding agrees with World Bank (2021) studies emphasizing the importance of environmental safeguards in infrastructure development. Similarly, Nguyen et al. (2023) found that environmental management measures contribute significantly to infrastructure sustainability and resilience. The findings suggest that stakeholders increasingly recognize the importance of integrating environmental considerations into project management processes.

However, respondents also questioned the consistency with which environmental management plans are implemented during construction. This finding differs from the assumptions underlying many environmental management frameworks, which generally assume that approved mitigation measures are implemented as planned. The discrepancy may be explained by competing project priorities, weak monitoring systems, and resource limitations that emerge during project implementation.

Perhaps the most interesting finding was that risk assessments conducted before project implementation received comparatively lower ratings than other mitigation measures. This finding partially contradicts Risk Management Theory as advanced by Hillson (2002), which positions risk identification and assessment as the foundation of effective risk management. It also differs from PMI (2021), which emphasizes risk assessment as the starting point for all subsequent risk management activities.

The qualitative findings provide a possible explanation for this difference. Respondents indicated that technical risks are generally assessed thoroughly, whereas political, environmental, institutional, and stakeholder-related risks are often more difficult to predict during project planning. This finding agrees with Flyvbjerg (2023), who argues that infrastructure projects frequently underestimate uncertainty because planners focus on measurable technical risks while overlooking governance and contextual risks. Consequently, the findings suggest that conventional risk assessment approaches may be more effective in identifying technical risks than broader institutional and environmental uncertainties.

A particularly important observation emerging from this objective is that respondents perceived risk mitigation strategies as effective while simultaneously identifying significant barriers affecting their implementation. At first glance, this appears contradictory. However, the findings suggest that stakeholders distinguish between the effectiveness of mitigation measures themselves and the conditions under which those measures are implemented. Respondents appear to believe that geotechnical investigations, contingency planning, supervision mechanisms, environmental management plans, and risk assessments are fundamentally sound approaches to risk management. At the same time, they recognize that funding constraints, institutional weaknesses, environmental uncertainty, and coordination challenges frequently limit the effectiveness of these measures in practice.

This finding both supports and extends Risk Management Theory. The findings support the theory because respondents consistently associated risk mitigation measures with improved project performance. However, the findings also challenge the implicit assumption that effective risk management processes automatically translate into effective project outcomes. Instead, the study demonstrates that implementation capacity, governance quality, institutional strength, and resource availability significantly influence the effectiveness of mitigation measures. The findings therefore suggest that successful risk management should be understood not only as a technical process but also as an institutional and governance process.

Overall, the findings demonstrate that risk mitigation strategies contribute significantly to the performance of public road construction projects in the Elgon Region. Nevertheless, their effectiveness depends heavily on the broader institutional and governance environment within which they are implemented. The findings therefore indicate that strengthening risk mitigation requires not only improved technical tools and methodologies but also stronger institutions, better coordination mechanisms, and enhanced implementation capacity.

5.3.4 Challenges Hindering the Implementation of Risk Mitigation Strategies

The fourth objective of the study sought to examine the challenges hindering the implementation of risk mitigation strategies in public road construction projects in the Elgon Region of Uganda. While the preceding findings demonstrated that risk mitigation strategies are generally perceived

as effective, the study also established that several financial, environmental, institutional, technical, and coordination-related challenges continue to undermine their implementation. This finding suggests that the effectiveness of risk mitigation measures does not depend solely on their technical design but also on the environment within which they are implemented.

One of the most significant findings was that delayed government funding emerged as the most serious challenge affecting the implementation of risk mitigation strategies. This finding suggests that the success of risk mitigation measures is highly dependent on the timely availability of financial resources. Respondents indicated that many mitigation activities, including slope stabilization, drainage improvements, environmental protection measures, supervision activities, and contingency interventions, require adequate funding to be implemented effectively. Where funding is delayed, mitigation measures are often postponed or implemented partially, increasing project vulnerability to risks.

These findings agree with the World Bank (2021), which identified delayed disbursement of project funds as one of the leading causes of implementation failures in public infrastructure projects across developing countries. Similarly, Locatelli et al. (2023) found that financial uncertainty frequently undermines the effectiveness of risk management systems because project teams are unable to execute planned interventions when resources are unavailable. The findings also support those of Kwofie, Fugar, and Adinyira (2022), who reported that delayed payments significantly reduce contractors' capacity to implement planned risk mitigation measures.

However, the findings differ from those reported by Kerzner (2022), whose project management framework assumes that approved mitigation measures are generally supported by adequate resource allocation mechanisms. In the context of the Elgon Region, respondents indicated that financial constraints often emerge after mitigation plans have already been developed. The difference may be explained by the dependence of public infrastructure projects on centralized government funding systems, which are susceptible to budgetary constraints, bureaucratic delays, and changing political priorities. Consequently, the findings suggest that effective risk mitigation requires not only technical planning but also reliable and predictable financing arrangements.

This finding also extends Risk Management Theory as advanced by Hillson (2002) and Hillson and Simon (2020). While the theory emphasizes risk identification, assessment, and response planning, the findings suggest that the successful implementation of risk responses depends significantly on financial capacity. Therefore, risk mitigation cannot be separated from broader resource management considerations.

The findings further revealed that environmental uncertainty remains a major challenge affecting implementation of risk mitigation measures. Respondents reported that landslides, heavy rainfall, flooding, erosion, and unstable terrain continue to create significant implementation difficulties despite the existence of mitigation plans. This finding suggests that environmental risks within the Elgon Region remain highly dynamic and difficult to predict.

These findings agree with Aven (2021), who argues that environmental uncertainty has become one of the most complex forms of project risk due to increasing climate variability. Similarly, Nguyen et al. (2023) found that infrastructure projects operating in environmentally sensitive areas frequently encounter challenges that cannot be fully anticipated during project planning. Flyvbjerg (2023) likewise observed that environmental uncertainty remains one of the leading contributors to cost overruns and schedule delays in major infrastructure projects.

However, the findings differ from earlier risk management literature that largely treated environmental risks as technical issues that could be controlled through engineering solutions. For example, Merna and Al-Thani (2018) suggest that comprehensive planning and technical investigations can substantially reduce environmental uncertainty. In contrast, respondents in the current study emphasized that environmental conditions often change rapidly and unpredictably, making complete control difficult even where extensive mitigation measures exist. This difference may be explained by the increasing frequency of extreme weather events and changing climatic conditions affecting mountainous regions such as the Elgon Sub-region.

The findings therefore suggest that environmental risks should increasingly be managed through adaptive and resilience-based approaches rather than relying solely on prediction and control. This observation aligns more closely with the resilience perspective proposed by Linkov and Trump

(2019), which emphasizes the capacity of systems to adapt to unexpected disruptions rather than attempting to eliminate uncertainty altogether.

Institutional capacity constraints also emerged as a major challenge affecting implementation of risk mitigation strategies. Respondents indicated that shortages of skilled personnel, inadequate equipment, limited financial resources, and weak organizational systems reduce the ability of implementing agencies to effectively execute planned mitigation measures. These findings suggest that technical solutions alone are insufficient where institutional systems lack the capacity to support implementation.

The findings agree with the African Development Bank (2021), which identified institutional weaknesses as one of the most significant barriers to infrastructure development across Africa. Similarly, Scott (2014) argues that formal systems derive their effectiveness from the institutions responsible for implementing them. Locatelli et al. (2023) also found that organizational capacity significantly influences the effectiveness of project risk management systems.

However, the findings differ from studies that primarily attribute project implementation challenges to technical deficiencies. For example, traditional engineering-oriented approaches often focus on design quality, technical specifications, and engineering expertise as the primary determinants of project success. In contrast, respondents in the current study consistently emphasized institutional and organizational factors. The difference may be explained by the public-sector context within which road construction projects operate, where implementation depends heavily on administrative systems, resource availability, and inter-agency coordination.

The findings further revealed that weak monitoring systems hinder effective implementation of mitigation measures. Respondents indicated that inadequate monitoring reduces the ability of project teams to identify emerging risks, assess the effectiveness of mitigation measures, and initiate corrective action when necessary. These findings agree with PMI (2021), which identifies monitoring and control as critical components of effective risk management. Similarly, Love et al. (2022) found that weak monitoring systems often result in delayed responses to emerging project threats.

However, the findings differ from the assumptions of Risk Management Theory, which generally treats monitoring as an integral part of risk management processes. The findings suggest that although monitoring mechanisms may formally exist, their effectiveness can be constrained by shortages of personnel, inadequate funding, and limited technological capacity. Consequently, the existence of monitoring systems does not necessarily guarantee effective monitoring outcomes.

Poor stakeholder coordination also emerged as a significant challenge affecting implementation of risk mitigation strategies. Respondents reported that communication gaps and differing priorities among contractors, consultants, government agencies, local authorities, and communities frequently hinder coordinated responses to project risks. This finding suggests that effective risk mitigation depends not only on technical competence but also on the ability of stakeholders to collaborate effectively.

The findings agree with Freeman's Stakeholder Theory (1984), which argues that successful organizational outcomes depend on effective engagement and coordination among stakeholders. Similarly, Ochieng et al. (2020) found that infrastructure projects characterized by strong stakeholder collaboration generally achieve better risk management outcomes. PMI (2021) likewise emphasizes stakeholder engagement as an essential element of project governance.

However, the findings differ from traditional project management approaches that assume project objectives can be achieved primarily through hierarchical management structures. Respondents indicated that risk mitigation frequently requires coordinated action among multiple actors whose interests and priorities may not always align. The findings therefore suggest that collaborative governance approaches may be more effective than purely top-down management structures in addressing project risks.

The study also revealed that limited availability of risk management tools and lack of technical expertise continue to affect implementation of mitigation measures. These findings agree with Hillson and Simon (2020), who emphasize the importance of analytical tools, forecasting systems, and technical competencies in supporting effective risk management. Similarly, PMI (2021) found that organizations possessing advanced risk management capabilities generally perform better than those relying on informal approaches.

However, respondents suggested that technological solutions alone cannot address implementation challenges. Even where tools and systems are available, their effectiveness depends on the skills of users and the institutional systems supporting their application. This finding differs from technology-centered approaches that portray digital systems as standalone solutions to project management challenges. Instead, the findings suggest that technology must be accompanied by investments in human capacity and organizational development.

Perhaps the most important finding emerging from this objective concerns the apparent contradiction between the effectiveness of risk mitigation strategies and the challenges affecting their implementation. While respondents strongly supported geotechnical investigations, contingency planning, supervision mechanisms, environmental management plans, and risk assessments, they simultaneously identified major obstacles affecting implementation. At first glance, these findings appear inconsistent. However, the evidence suggests that respondents distinguished between the quality of mitigation measures and the conditions under which those measures are implemented.

This finding agrees with Scott (2014), who argues that organizations may possess effective formal systems while still experiencing implementation difficulties due to institutional constraints. Similarly, Flyvbjerg (2023) observed that many infrastructure projects fail not because appropriate risk management tools are absent but because organizational and governance systems struggle to apply them effectively. The findings therefore suggest that the central challenge facing public road construction projects in the Elgon Region is not the design of mitigation measures but the institutional environment within which those measures are implemented.

The findings provide both support for and a qualification of Risk Management Theory. The findings support the theory because respondents consistently associated mitigation measures with improved project performance, quality, and resilience. However, they also challenge the implicit assumption that effective mitigation measures automatically produce effective outcomes. The study demonstrates that implementation capacity, funding availability, environmental uncertainty, institutional strength, and stakeholder coordination significantly influence the effectiveness of risk management interventions. Consequently, successful risk management should be viewed not only as a technical process but also as an institutional, governance, and resource management challenge.

Overall, the findings demonstrate that challenges affecting implementation of risk mitigation strategies are largely institutional, financial, environmental, and governance-related rather than purely technical. Delayed funding, environmental uncertainty, institutional weaknesses, weak monitoring systems, poor stakeholder coordination, limited technical expertise, and inadequate risk management tools emerged as major barriers. The findings therefore suggest that improving risk mitigation outcomes requires strengthening both the technical and institutional dimensions of project risk management.

5.3.5 Strategies for Improving Risk Allocation and Mitigation Practices in Public Road Construction Projects

The fifth objective of the study sought to identify strategies for improving risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda. The findings revealed strong stakeholder support for reforms aimed at strengthening contractual clarity, institutional capacity, risk assessment processes, monitoring systems, technical competencies, stakeholder participation, supervision mechanisms, and adoption of modern risk management technologies. These findings suggest that stakeholders recognize that improvements in project risk management require interventions that extend beyond technical solutions and address broader institutional and governance challenges.

One of the most strongly supported recommendations was the need for construction contracts to clearly define risk responsibilities. This finding suggests that stakeholders view contractual clarity as the foundation of effective project risk management. Respondents indicated that many disputes and implementation challenges arise because project participants interpret contractual responsibilities differently when risks materialize. Clear allocation of risk responsibilities was therefore perceived as essential for reducing uncertainty and strengthening accountability.

These findings agree with Yescombe (2018), who argues that infrastructure contracts should clearly define risk ownership to minimize disputes and improve project performance. Similarly, El-Sayegh et al. (2022) found that projects characterized by clear contractual allocation of risks generally experience fewer disputes and better implementation outcomes than projects where

responsibilities remain ambiguous. Liu et al. (2021) likewise reported that contractual clarity strengthens stakeholder accountability and improves coordination among project actors.

The findings also support the assumptions of Contract Theory as developed by Coase (1937) and later expanded by Williamson (1985). The theory argues that clearly specifying responsibilities reduces uncertainty, minimizes transaction costs, and improves organizational efficiency. The strong support for clearer contractual provisions suggests that stakeholders recognize the value of assigning risks to parties with appropriate expertise and capacity.

However, the findings also suggest that contractual clarity alone may not be sufficient to ensure effective risk management. Throughout the study, respondents consistently identified political influence, institutional weaknesses, and delayed decision-making as significant barriers affecting project implementation. This finding differs from some interpretations of Contract Theory that place primary emphasis on contractual arrangements as the mechanism for controlling project uncertainty. The findings instead suggest that even well-designed contracts may fail to achieve intended outcomes if they are implemented within weak institutional environments. Consequently, the study extends Contract Theory by demonstrating that contractual effectiveness depends significantly on governance and institutional conditions.

The findings further revealed strong support for strengthening institutional capacity. Respondents emphasized the need for additional technical personnel, improved organizational systems, enhanced training, and greater resource availability within institutions responsible for implementing road construction projects. This finding suggests that stakeholders perceive institutional capacity as a critical determinant of effective risk management.

These findings agree with the African Development Bank (2021), which identified institutional strengthening as a key requirement for improving infrastructure project performance across Africa. Similarly, the World Bank (2021) argues that successful infrastructure delivery depends not only on technical design but also on the capacity of institutions responsible for project implementation. Locatelli et al. (2023) likewise found that institutional quality significantly influences the effectiveness of project governance and risk management systems.

The findings also support Scott's Institutional Theory (2014), which argues that formal systems derive their effectiveness from the institutional environments within which they operate. The strong support for institutional strengthening throughout the study reinforces the argument that effective project risk management requires capable institutions that can implement, monitor, and enforce risk management measures.

However, the findings differ from earlier infrastructure studies that focused primarily on engineering solutions as the basis for project improvement. For example, traditional project management approaches often emphasize technical design improvements, engineering innovations, and construction methodologies. In contrast, respondents in the current study consistently emphasized institutional reforms. This difference may reflect growing recognition within contemporary infrastructure literature that governance and institutional effectiveness are as important as technical competence in determining project outcomes.

The findings also revealed strong support for strengthening risk assessment during project planning. Respondents emphasized the importance of identifying project risks before implementation begins. This finding suggests that stakeholders view proactive planning as an important mechanism for reducing uncertainty and improving project preparedness.

These findings agree with Hillson and Simon (2020), who argue that systematic risk identification and assessment form the foundation of effective risk management. Similarly, PMI (2021) emphasizes that early identification of risks enables project teams to develop appropriate response strategies before threats materialize. Flyvbjerg (2023) also argues that many infrastructure project failures can be traced to inadequate consideration of risks during planning stages.

However, the findings also suggest that conventional risk assessments may not adequately capture political, institutional, environmental, and stakeholder-related risks. This observation emerged repeatedly throughout the study, where respondents acknowledged that technical risks are often assessed comprehensively while governance-related risks receive less attention. This finding differs from traditional risk management approaches that assume comprehensive risk assessments can adequately anticipate future project uncertainties. The findings therefore suggest that future

risk assessments should adopt broader frameworks capable of incorporating governance, environmental, and institutional risks alongside technical considerations.

Strong support was also expressed for strengthening project monitoring systems. Respondents emphasized that continuous monitoring is essential for identifying emerging risks and evaluating the effectiveness of mitigation measures during implementation. This finding suggests that stakeholders recognize monitoring as a critical component of project risk management.

The findings agree with PMI (2021), which identifies monitoring and control as essential stages within the project risk management process. Similarly, Love et al. (2022) found that effective monitoring improves project outcomes by enabling timely corrective action when risks emerge. Ochieng et al. (2020) likewise reported that projects characterized by strong monitoring systems generally experience better implementation outcomes than those with weak oversight mechanisms.

The findings further support Risk Management Theory as developed by Hillson (2002), which emphasizes continuous monitoring as an essential mechanism for managing uncertainty. However, respondents indicated that monitoring systems frequently suffer from resource constraints and capacity limitations. This finding suggests that monitoring effectiveness depends not only on the existence of monitoring frameworks but also on the resources and institutional support available for implementation.

Training and capacity development also emerged as highly supported interventions. Respondents emphasized the need to improve competencies in risk identification, contract management, environmental management, project supervision, and stakeholder engagement. This finding suggests that stakeholders perceive human resource development as central to improving project risk management.

These findings agree with PMI (2021), which emphasizes professional competence as a critical determinant of project success. Similarly, Kerzner (2022) argues that organizations with stronger project management competencies generally achieve better risk management outcomes. Hillson and Simon (2020) likewise found that risk management systems are most effective when supported by personnel possessing appropriate technical skills and experience.

However, the findings differ from technology-centered perspectives that emphasize software tools and analytical systems as the primary drivers of improved risk management. Respondents consistently emphasized human capacity alongside technological improvements. This suggests that technology alone cannot compensate for deficiencies in technical expertise and organizational competence. Consequently, investments in training appear equally important as investments in risk management technologies.

The findings also revealed strong support for improved supervision mechanisms and adoption of modern risk management tools. Respondents emphasized the importance of digital monitoring systems, forecasting tools, project management software, and other technological innovations capable of improving risk identification and decision-making processes.

These findings agree with Locatelli et al. (2023), who argue that digital technologies are increasingly important for infrastructure project management. Similarly, PMI (2021) reports that data analytics and digital monitoring systems improve project visibility and facilitate timely decision-making. Love et al. (2022) likewise found that technology-based monitoring systems improve project oversight and reduce information gaps among stakeholders.

However, respondents also emphasized that technology must be accompanied by institutional reforms and technical capacity development. This finding differs from studies that portray technological innovation as a standalone solution to project management challenges. The findings suggest that technology can only improve risk management when supported by capable institutions and skilled personnel.

Finally, the findings revealed strong support for greater stakeholder participation during project planning and implementation. Respondents emphasized that contractors, consultants, local governments, communities, and other project actors should be involved more actively in project decision-making processes. This finding suggests that stakeholders view participation as important for improving risk identification, strengthening project ownership, and enhancing implementation effectiveness.

These findings agree with Freeman's Stakeholder Theory (1984), which argues that organizational success depends on meaningful engagement with stakeholders affected by organizational

decisions. Similarly, Ochieng et al. (2020) found that stakeholder participation improves project governance and risk management outcomes. The World Bank (2021) also emphasizes stakeholder engagement as a critical component of sustainable infrastructure development.

However, the findings differ from traditional top-down infrastructure planning approaches that concentrate decision-making authority within government institutions and technical agencies. Respondents consistently suggested that risks are more effectively identified and managed when multiple stakeholders contribute their knowledge and experience. This finding therefore supports contemporary governance approaches emphasizing collaboration, participation, and shared responsibility in infrastructure management.

The findings collectively demonstrate that stakeholders recognize the need for comprehensive reforms that address both the technical and institutional dimensions of project risk management. While contractual improvements, risk assessments, monitoring systems, supervision mechanisms, and technological innovations were strongly supported, respondents consistently emphasized that their effectiveness depends on institutional capacity, stakeholder participation, technical competence, and governance quality.

The findings therefore support both Contract Theory and Risk Management Theory while simultaneously extending them. Contract Theory explains the importance of clearly allocating responsibilities and reducing uncertainty through contractual arrangements. Risk Management Theory explains the importance of systematic identification, assessment, monitoring, and mitigation of project risks. However, the findings demonstrate that neither theory fully explains project outcomes unless institutional capacity, governance systems, political realities, and stakeholder relationships are also considered. Consequently, the study suggests that effective risk management in public road construction projects requires an integrated approach that combines sound contractual arrangements, systematic risk management processes, strong institutions, effective governance, and meaningful stakeholder engagement.

Overall, the findings indicate that improving risk allocation and mitigation practices in public road construction projects requires a holistic approach that simultaneously strengthens contractual frameworks, institutional capacity, technical competencies, monitoring systems, stakeholder

participation, and technological capabilities. Such reforms are likely to improve project performance, strengthen infrastructure resilience, and enhance the effectiveness of public investment in road construction within the Elgon Region.

5.4 Conclusions

This study assessed risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda. The study concludes that while public road construction projects have established formal risk management systems, the effectiveness of these systems is determined less by their technical design and more by the institutional, governance, and environmental contexts within which they operate. The findings demonstrate that risk management challenges in the Elgon Region do not primarily arise from the absence of risk allocation and mitigation mechanisms, but from weaknesses in their implementation. Consequently, improving project performance requires attention not only to technical risk management tools but also to the governance structures and institutional capacities that support their application.

5.4.1 Effectiveness of Risk Allocation Practices in Public Road Construction Projects

The study concludes that risk allocation remains an important contributor to project performance in public road construction projects. The evidence suggests that clear assignment of responsibilities improves accountability, facilitates decision-making, reduces disputes, and supports project implementation. However, the study further concludes that the effectiveness of risk allocation should not be interpreted as evidence that risks are always allocated optimally. Rather, stakeholders appear to recognize the value of risk allocation as a management framework even though significant barriers continue to affect its implementation.

A particularly important conclusion emerging from the study is that environmental and climate-related risks challenge traditional approaches to risk allocation. Unlike technical risks, which can often be assigned to specific stakeholders according to expertise and contractual obligations, environmental risks are frequently shared, unpredictable, and influenced by factors beyond the control of individual project actors. The study therefore concludes that future risk allocation frameworks in the road sector must move beyond conventional contractual approaches and adopt more adaptive mechanisms capable of addressing growing environmental uncertainty.

5.4.2 Challenges Affecting Effective Risk Allocation

The study concludes that the greatest obstacles to effective risk allocation are governance and institutional challenges rather than technical deficiencies. The prominence of political influence, delayed decision-making, institutional weaknesses, and contractual ambiguities suggests that risk allocation decisions are not always determined by technical competence or contractual principles. Instead, they are frequently shaped by broader administrative and political considerations.

An important conclusion arising from this finding is that reforms aimed at improving risk allocation are unlikely to succeed if they focus exclusively on contractual improvements. The study demonstrates that even well-designed contracts can fail to achieve intended outcomes when implemented within weak institutional environments. Consequently, risk management reform in Uganda's road construction sector cannot be achieved through engineering and contractual solutions alone. It requires strengthening governance systems, improving institutional accountability, reducing political interference in project management decisions, and enhancing organizational capacity for contract administration.

5.4.3 Effectiveness of Risk Mitigation Strategies

The study concludes that risk mitigation strategies contribute significantly to infrastructure quality, project resilience, cost control, and implementation effectiveness. Measures such as geotechnical investigations, contingency planning, supervision mechanisms, environmental management plans, and risk assessments provide important mechanisms for reducing project uncertainty and improving decision-making.

However, the study further concludes that risk mitigation should not be viewed as a means of eliminating risk. Rather, its primary value lies in improving the capacity of projects to anticipate, respond to, and recover from adverse events. This conclusion is particularly important in the context of the Elgon Region, where environmental conditions remain highly dynamic and unpredictable. The findings therefore suggest that successful project risk management is increasingly dependent on adaptability and resilience rather than on prediction and control alone.

5.4.4 Challenges Hindering the Implementation of Risk Mitigation Strategies

The study concludes that the effectiveness of risk mitigation strategies is constrained primarily by implementation challenges rather than weaknesses in the mitigation measures themselves. Delayed government funding, environmental uncertainty, institutional capacity limitations, weak monitoring systems, inadequate technical expertise, and poor stakeholder coordination emerged as the principal barriers preventing mitigation measures from achieving their full potential.

A key conclusion arising from this finding is that the success of risk mitigation interventions depends as much on organizational and financial capacity as on technical design. The study demonstrates that technically sound mitigation measures may still fail when institutions lack the resources, authority, coordination mechanisms, or expertise required for effective implementation. Consequently, strengthening risk mitigation requires investments not only in technical systems but also in institutional development, financial management, monitoring capacity, and stakeholder collaboration.

5.4.5 Overall Conclusion

The central conclusion of this study is that public road construction projects in the Elgon Region do not suffer from a lack of risk management frameworks. Rather, they suffer from a gap between the design of risk management systems and their implementation in practice. Stakeholders generally regard risk allocation and mitigation mechanisms as effective, yet they simultaneously acknowledge significant governance, institutional, financial, and environmental constraints that limit their effectiveness.

The study therefore concludes that future improvements in road project performance will depend less on developing new risk management tools and more on strengthening the institutional environment within which existing tools operate. Sustainable improvements in project outcomes will require integrated reforms that combine sound contractual arrangements, effective governance, strong institutions, adequate financing, technical competence, stakeholder participation, and adaptive approaches to managing environmental uncertainty.

5.5 Recommendations

The recommendations are presented according to the study objectives and are directed to the Ministry of Works and Transport, district local governments, contractors, consultants, development partners, and other stakeholders involved in public road construction projects.

5.5.1 Recommendations for Improving Risk Allocation Practices

The Ministry of Works and Transport should revise its standard bidding and contract documents to require project-specific risk registers for all road construction projects located in environmentally sensitive areas such as the Elgon Region. The risk registers should identify major geotechnical, hydrological, environmental, financial, contractual, and operational risks, specify the party responsible for managing each risk, and outline monitoring and reporting requirements. Compliance should be verified during contract approval and before contractor mobilization. Success should be measured through a reduction in risk-related disputes, contract variations, and project delays.

The Ministry of Works and Transport, in collaboration with district local governments and consulting engineers, should require mandatory climate and environmental risk allocation plans for road projects implemented in landslide-prone districts such as Mbale, Bulambuli, Sironko, Manafwa, and Namisindwa. These plans should clearly define responsibilities for managing erosion, slope instability, flooding, drainage failures, and climate-related disruptions. The objective should be to ensure that environmental risks are addressed proactively rather than transferred ambiguously between project stakeholders.

Consulting firms responsible for project design should incorporate risk allocation reviews as part of the design approval process. Before tender documents are issued, an independent technical review team should verify that major project risks have been allocated to parties with the appropriate technical, financial, and managerial capacity to manage them. This measure would help reduce situations where contractors assume risks beyond their control, which often contributes to disputes and poor project performance.

5.5.2 Recommendations for Addressing Challenges Affecting Risk Allocation

The Ministry of Works and Transport should establish an independent Project Risk Review Committee within three years to review risk allocation arrangements for major road projects before procurement commences. The committee should comprise representatives from the Ministry, district local governments, engineering professional bodies, environmental agencies, and procurement specialists. Its role should be to ensure that risk allocation decisions are based on technical and contractual considerations rather than external political influences. Performance should be assessed through periodic audits of risk allocation decisions and project outcomes.

The Ministry of Works and Transport should implement annual capacity-building programs for project managers, engineers, procurement officers, contract managers, and district engineering staff. The training should focus on risk identification, risk allocation techniques, contract administration, dispute management, environmental risk management, and project governance. A target should be established requiring at least 80 percent of personnel directly involved in road project management to receive certified risk management training within five years.

To address delays in decision-making, the Ministry should introduce digital approval and workflow management systems for road construction projects. Project approvals related to variations, mitigation measures, and risk management interventions should be processed within predetermined timelines. For example, routine project risk decisions should be completed within fourteen working days. Compliance should be monitored through quarterly performance reports and project audits.

5.5.3 Recommendations for Strengthening Risk Mitigation Strategies

The Ministry of Works and Transport should make comprehensive geotechnical, hydrological, environmental, and climate risk assessments mandatory for all road construction projects before procurement and contract award. No contractor should be mobilized before the completion and approval of these assessments. Particular attention should be given to road projects located in mountainous and environmentally fragile areas of the Elgon Region. Success should be measured through reductions in landslide-related disruptions, emergency design modifications, and environmental damage during project implementation.

Project managers and supervising consultants should be required to review and update project contingency plans at least every six months throughout the implementation period. The revised plans should be submitted to the Ministry as part of routine project performance reporting. This requirement would ensure that contingency planning remains responsive to changing project conditions rather than existing merely as a planning document.

The Ministry of Works and Transport should progressively invest in modern risk management technologies over the next five years. Priority investments should include Geographic Information Systems (GIS), drone-based site inspections, digital project monitoring platforms, electronic risk registers, and predictive analytics tools. Pilot implementation should begin with projects in high-risk districts within the Elgon Region before scaling up nationally. Success should be measured through improvements in risk detection, monitoring efficiency, and project reporting accuracy.

5.5.4 Recommendations for Addressing Challenges Affecting Risk Mitigation Implementation

The Ministry of Finance, Planning and Economic Development, working with the Ministry of Works and Transport, should establish protected funding schedules for road construction projects to ensure timely release of funds for approved mitigation measures. Project funding disbursements should be linked to implementation milestones and released according to predetermined schedules. The effectiveness of this intervention should be evaluated through reductions in project delays attributed to funding shortages and improved implementation of planned mitigation activities.

The Ministry of Works and Transport should strengthen institutional capacity by recruiting additional geotechnical engineers, environmental specialists, project risk analysts, and monitoring officers over the next five years. Priority should be given to regions characterized by high environmental risk, including the Elgon Region. Staffing levels should be reviewed annually against project workloads to ensure adequate technical support for project implementation.

District local governments, contractors, consultants, and Ministry officials should institutionalize quarterly multi-stakeholder coordination meetings for all major road construction projects. These meetings should focus specifically on emerging project risks, implementation challenges, mitigation progress, and stakeholder concerns. Meeting resolutions should be documented and

integrated into project management plans. Success should be measured through improvements in stakeholder satisfaction, reduction in disputes, and faster resolution of project risks.

The Ministry of Works and Transport should strengthen project monitoring and evaluation systems by requiring monthly risk monitoring reports and quarterly independent risk audits for major road construction projects. The monitoring framework should include indicators relating to environmental risks, implementation of mitigation measures, funding performance, stakeholder engagement, and project governance. This would enable early identification of implementation challenges and support timely corrective action.

5.5.5 Recommendation for Policy and Future Practice

The findings of this study demonstrate that the principal challenge facing road construction projects in the Elgon Region is not the absence of risk management frameworks but weaknesses in implementation. The Ministry of Works and Transport should therefore develop a National Road Construction Risk Management Framework that integrates contractual risk allocation, environmental risk management, project governance, stakeholder engagement, funding mechanisms, and monitoring systems into a single policy framework. Such a framework would provide a standardized approach to managing risks across road projects and strengthen the resilience of public infrastructure investments in Uganda.

5.6 Contribution of the Study

This study makes theoretical, empirical, methodological, policy, and practical contributions to the field of infrastructure project risk management. The contributions arise from the study's examination of risk allocation and mitigation practices in public road construction projects within the unique institutional, governance, and environmental context of the Elgon Region of Uganda.

5.6.1 Contribution to Knowledge

This study contributes to the limited empirical literature on risk management in public road construction projects in Uganda by examining risk allocation and risk mitigation as interconnected rather than independent dimensions of project risk management. While previous studies in Uganda and other developing countries have largely focused on project delays, cost overruns, procurement

challenges, or general project management constraints, few have simultaneously examined how risks are allocated, mitigated, and implemented within the same infrastructure context. The study therefore provides context-specific evidence from the Elgon Region, an area characterized by significant environmental, institutional, and governance challenges that directly affect infrastructure delivery.

A major empirical contribution of the study is the identification of a persistent gap between the formal design of risk management systems and their practical implementation. The findings revealed that stakeholders generally perceived risk allocation and risk mitigation practices as effective, yet they simultaneously reported substantial challenges affecting their implementation. This finding demonstrates that the primary challenge facing public road construction projects is not the absence of risk management frameworks but the difficulty of implementing them effectively within complex institutional, financial, political, and environmental contexts. This distinction has received limited attention in existing Ugandan infrastructure literature, which often treats project risk management failures as evidence of weak systems rather than implementation weaknesses.

The study further contributes new evidence regarding the relative importance of governance factors in project risk management. Political influence emerged as the most significant challenge affecting risk allocation, while delayed government funding emerged as the most significant challenge affecting implementation of risk mitigation measures. These findings suggest that governance and institutional factors exert greater influence on project risk outcomes than many purely technical factors. This challenges the traditional assumption within parts of the construction management literature that project risk management problems are primarily technical in nature. Instead, the study demonstrates that risk management effectiveness is strongly influenced by political, administrative, and organizational realities.

The study also contributes to the growing literature on environmental risk management in infrastructure projects. Environmental risks consistently emerged across multiple study objectives as both a major challenge and a critical area requiring intervention. At the same time, geotechnical investigations were identified as the most effective risk mitigation strategy. The study therefore provides empirical evidence that environmental and geotechnical considerations are becoming

increasingly central to infrastructure risk management in environmentally sensitive regions such as the Elgon Sub-region. This finding contributes to contemporary debates regarding climate resilience and infrastructure sustainability in developing countries.

5.6.2 Contribution to Theory

The study contributes to Contract Theory, particularly as advanced by Hart and Holmström (2017), by demonstrating that the effectiveness of contractual risk allocation in public road construction projects depends not only on the formal design of contracts but also on the institutional and operational environment within which contracts are implemented. The findings reveal that factors such as unclear contractual provisions, institutional weaknesses, political influence, delayed decision-making, and unequal bargaining power between government entities and contractors affect the extent to which contractual risk allocation achieves its intended purpose. These findings extend Contract Theory by highlighting that even well-designed contractual arrangements may fail to produce efficient outcomes where implementation conditions, stakeholder capacity, and governance mechanisms are weak.

The study further contributes to Contract Theory by reinforcing the principle that risks should be allocated to parties with the greatest ability to manage them effectively. The findings indicate that when risks are assigned to stakeholders without adequate technical, financial, or institutional capacity, the likelihood of project disputes, delays, cost escalation, and reduced performance increases. Therefore, the study demonstrates that effective risk allocation requires more than the inclusion of risk clauses in contracts; it requires alignment between contractual responsibilities, stakeholder capabilities, and the broader governance context of public infrastructure delivery.

The study also contributes to Risk Management Theory as conceptualized by the Project Management Institute (2021) and Hillson and Simon (2020) by providing empirical evidence that systematic risk identification, assessment, response planning, mitigation, and monitoring are essential for improving project performance. The findings confirm the theoretical proposition that proactive risk management practices contribute to better control of project costs, schedules, quality outcomes, and overall project effectiveness.

However, the study extends Risk Management Theory by demonstrating that the presence of formal risk management practices alone does not guarantee successful project outcomes. The effectiveness of risk mitigation strategies is influenced by contextual factors including availability of funding, institutional capacity, stakeholder coordination, supervision mechanisms, and environmental uncertainties. This suggests that risk management effectiveness depends not only on the technical application of risk management processes but also on the capacity of institutions and stakeholders to implement and sustain those processes.

Overall, the study contributes to the theoretical understanding of public infrastructure risk management by integrating contractual and managerial perspectives. The combined application of Contract Theory and Risk Management Theory demonstrates that effective project performance emerges from the interaction between appropriate risk allocation mechanisms and effective risk mitigation practices. The findings further show that in developing-country contexts such as Uganda, infrastructure risk governance is shaped by both technical risk management capabilities and institutional realities, thereby providing a broader understanding of how risk management theories operate within complex public sector environments.

5.6.3 Methodological Contribution

Methodologically, the study demonstrates the value of integrating quantitative and qualitative approaches in the examination of infrastructure project risk management. The quantitative findings identified the prevalence and relative importance of specific risk allocation and mitigation practices, while the qualitative findings provided explanations for why these practices succeed or fail in practice.

The mixed-methods approach enabled the study to uncover an important finding that may not have emerged through a single-method design: stakeholders simultaneously perceived risk management practices as effective while acknowledging substantial implementation challenges. The qualitative evidence helped explain this apparent contradiction by revealing that respondents distinguished between the effectiveness of risk management frameworks and the realities of implementing those frameworks within public-sector environments. The study therefore illustrates the value of mixed-methods research in generating deeper insights into complex project management phenomena.

5.6.4 Policy Contribution

The study provides evidence that can inform infrastructure policy development in Uganda, particularly within the road construction sector. The findings indicate that policy interventions should move beyond technical project management reforms and place greater emphasis on governance, institutional strengthening, funding predictability, and accountability mechanisms.

The evidence generated by the study supports the need for stronger contractual risk allocation frameworks, improved project financing systems, enhanced institutional capacity, greater stakeholder participation, and more rigorous monitoring of project risks. The findings may therefore assist the Ministry of Works and Transport, district local governments, regulatory agencies, and development partners in designing policies aimed at improving infrastructure resilience and project performance.

The study also highlights the need for greater integration of environmental and climate-related risks within infrastructure planning and contract management processes. This has important implications for future road development policies in environmentally vulnerable regions of Uganda.

5.6.5 Practical Contribution

At the practical level, the study provides evidence-based guidance for project managers, contractors, consulting engineers, supervising consultants, procurement professionals, and local government officials involved in public road construction projects.

The findings demonstrate the importance of strengthening risk allocation frameworks, conducting comprehensive risk assessments, investing in geotechnical investigations, improving project supervision, enhancing stakeholder coordination, and establishing effective monitoring systems. The study further highlights the practical consequences of political interference, delayed funding, weak institutional capacity, and poor coordination on project risk outcomes.

Perhaps most importantly, the study provides practical evidence that improving project performance requires more than technical competence alone. Successful risk management depends on the ability of institutions and stakeholders to implement risk management measures consistently

and effectively throughout the project lifecycle. This insight provides a practical foundation for improving the planning, implementation, and governance of public road construction projects in Uganda and similar developing-country contexts.

5.7 Limitations of the Study

The study was conducted using a cross-sectional research design, which captured respondents' views at a particular point in time. Consequently, the study could not examine changes in risk allocation and mitigation practices throughout the different phases of the road construction project lifecycle. A longitudinal study would provide further insights into how risk management practices develop and change from project initiation to completion.

The study relied largely on self-reported information obtained from respondents through questionnaires and interviews. Although confidentiality and anonymity were emphasized to encourage honest responses, some participants may have provided socially desirable answers or may have been hesitant to disclose weaknesses related to their organizations, contract management practices, or institutional processes. This may have introduced a degree of response bias into the findings.

The study also noted a tendency towards relatively high and closely clustered mean scores across the study constructs, with most responses falling within the “agree” and “strongly agree” categories. Such patterns may suggest the possibility of social desirability bias or common-method bias, where respondents provide consistently positive assessments due to perceptions, professional relationships, or sensitivity surrounding public infrastructure project performance. However, this limitation was minimized through the assurance of confidentiality, the use of neutral and objectively worded questionnaire items, triangulation with qualitative data from interviews and document reviews, and the use of multiple sources of evidence to enhance the credibility of the findings.

Furthermore, the study was limited to selected public road construction projects within the Elgon Region of Uganda. While the selected projects provided relevant insights into risk allocation and mitigation practices, caution should be exercised when generalizing the findings to all public

infrastructure projects across Uganda, as variations may exist due to differences in institutional capacity, geographical conditions, project size, and contractual arrangements.

The study also encountered logistical challenges in accessing some respondents due to their busy schedules and the geographical dispersion of project locations. These challenges were addressed through flexible interview arrangements, advance communication, and follow-up engagements to ensure adequate participation and completion of data collection activities.

5.8 Recommendations for Further Research

Future studies should examine the relationship between risk allocation practices and project performance using inferential statistical techniques such as correlation, regression, and structural equation modelling.

Further research should investigate climate-related risks and climate-resilient infrastructure strategies within road construction projects in environmentally sensitive regions.

Future studies should also compare risk management practices across different categories of infrastructure projects, including roads, water supply systems, energy projects, and public buildings, to identify sector-specific differences and best practices.

Researchers may further undertake longitudinal studies to assess how risk allocation and mitigation practices evolve throughout the planning, implementation, and operational phases of infrastructure projects.

5.9 Chapter Summary

This chapter presented the summary of findings, discussion of findings, conclusions, recommendations, contributions of the study, limitations of the study, and recommendations for further research. The study established that risk allocation and mitigation practices contribute positively to the performance of public road construction projects in the Elgon Region of Uganda. However, several challenges, including political influence, institutional weaknesses, delayed government funding, environmental uncertainties, weak monitoring systems, and limited technical capacity, continue to undermine effective risk management.

The study concludes that strengthening contractual risk allocation mechanisms, enhancing institutional capacity, improving project financing systems, strengthening monitoring and evaluation frameworks, promoting stakeholder coordination, and adopting modern risk management technologies are essential for improving project performance and infrastructure outcomes in Uganda's road construction sector.

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APPENDIX I: SURVEY QUESTIONNAIRE

Introduction

Dear Respondent,

You are kindly requested to participate in this study titled:

“An Assessment of Risk Allocation and Mitigation Practices in Public Road Construction Projects in Uganda: A Case Study of Selected Projects in the Elgon Region.”

This study is being conducted by **Ogik Alfred** as part of the requirements for the award of a **Master’s Degree in Public Infrastructure Management at Makerere University**.

The purpose of this study is to examine how risks are allocated and mitigated in public road construction projects in the Elgon Region of Uganda. The study further seeks to assess the effectiveness of risk allocation practices, examine the challenges affecting effective risk allocation, evaluate the effectiveness of risk mitigation strategies, and identify challenges hindering the implementation of such strategies. The findings will contribute to improving infrastructure project management and enhancing the performance of public road construction projects.

The Elgon Region in this study includes districts within **Bugisu and Sebei sub-regions**, such as **Mbale City, Mbale District, Bududa, Manafwa, Sironko, Bulambuli, Kapchorwa, Bukwo, and Kween**.

The information you provide will be treated with **strict confidentiality** and will be used strictly for academic purposes. Participation in this study is **voluntary**, and you may withdraw at any time.

Please respond by ticking (✓) the most appropriate option.

Thank you for your cooperation.

Researcher:

Ogik Alfred

Section A: Background Information

1. Gender
 - ☐ Male
 - ☐ Female
2. Age Group
 - ☐ 20–29 years
 - ☐ 30–39 years
 - ☐ 40–49 years
 - ☐ 50 years and above
3. Education Level
 - ☐ Diploma
 - ☐ Bachelor's Degree
 - ☐ Master's Degree
 - ☐ Doctorate
 - ☐ Other (Specify) _____
4. Position in the Project
 - ☐ Project Manager/Site Engineer
 - ☐ Deputy Project Manager / Site Engineer
 - ☐ Materials Engineer
 - ☐ Quantity Surveyor
 - ☐ Resident Engineer
 - ☐ Deputy Resident Engineer
5. ☐ Materials Engineer
 - ☐ Contract Manager/Engineer
 - ☐ Deputy Contract Manager/Engineer
 - ☐ Procurement Officer
 - ☐ District Engineer

6. ☐ Supervisor of Works
☐ Assistant Engineering Officer
☐ Inspector of Works
☐ Government Official
7. Years of Experience in Road Construction Projects
☐ Less than 5 years
☐ 5–10 years
☐ 11–15 years
☐ More than 15 years
8. District where the project is located
☐ Mbale City
☐ Mbale District
☐ Bududa
☐ Manafwa
☐ Sironko
☐ Bulambuli
☐ Kapchorwa
☐ Bukwo
☐ Kween

Section B: Effectiveness of Risk Allocation Practices

Objective 1: **To evaluate the effectiveness of risk allocation practices in public road construction projects in the Elgon Region of Uganda.**

Please indicate your level of agreement with the following statements.

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Risks in road construction projects are clearly defined in construction contracts.	☐	☐	☐	☐	☐
Construction contracts allocate risks to the parties best able to manage them.	☐	☐	☐	☐	☐
Financial risks are clearly allocated between clients and contractors.	☐	☐	☐	☐	☐
Environmental risks are adequately addressed in construction contracts.	☐	☐	☐	☐	☐
Technical risks are allocated to stakeholders with appropriate expertise.	☐	☐	☐	☐	☐
Proper risk allocation contributes to timely completion of road projects.	☐	☐	☐	☐	☐
Effective risk allocation reduces disputes among project stakeholders.	☐	☐	☐	☐	☐
Effective risk allocation improves overall project performance.	☐	☐	☐	☐	☐

Section C: Challenges Affecting Effective Risk Allocation

Objective 2: To examine the challenges affecting effective risk allocation in public road construction contracts in the Elgon Region of Uganda.

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Construction contracts contain unclear provisions regarding risk responsibilities.	☐	☐	☐	☐	☐
Political influence affects risk allocation in public road projects.	☐	☐	☐	☐	☐
Limited institutional capacity affects effective risk allocation.	☐	☐	☐	☐	☐
Imbalance in bargaining power between government and contractors affects risk allocation.	☐	☐	☐	☐	☐
Lack of stakeholder participation affects proper risk allocation.	☐	☐	☐	☐	☐
Delays in decision-making contribute to poor risk allocation.	☐	☐	☐	☐	☐
Inadequate contract management skills affect effective risk allocation.	☐	☐	☐	☐	☐
Institutional weaknesses affect the proper distribution of project risks.	☐	☐	☐	☐	☐

Section D: Effectiveness of Risk Mitigation Strategies

Objective 3: To assess the effectiveness of risk mitigation strategies implemented in public road construction projects in the Elgon Region of Uganda.

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Road construction projects conduct adequate risk assessments before project implementation.	☐	☐	☐	☐	☐
Contingency planning helps reduce risks in road construction projects.	☐	☐	☐	☐	☐
Geotechnical investigations help reduce environmental and technical risks.	☐	☐	☐	☐	☐
Project supervision mechanisms help minimize construction risks.	☐	☐	☐	☐	☐
Environmental management plans reduce environmental risks during construction.	☐	☐	☐	☐	☐
Risk mitigation strategies improve the quality of road infrastructure.	☐	☐	☐	☐	☐
Risk mitigation practices help reduce project delays.	☐	☐	☐	☐	☐
Risk mitigation measures improve project cost control.	☐	☐	☐	☐	☐

Section E: Challenges Hindering Implementation of Risk Mitigation Strategies

Objective 4: **To identify the challenges hindering the effective implementation of risk mitigation strategies in public road construction projects in the Elgon Region of Uganda.**

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Delayed government funding affects implementation of risk mitigation measures.	☐	☐	☐	☐	☐
Lack of technical expertise limits effective risk mitigation.	☐	☐	☐	☐	☐
Weak monitoring systems hinder effective implementation of mitigation strategies.	☐	☐	☐	☐	☐
Environmental uncertainties make risk mitigation difficult.	☐	☐	☐	☐	☐
Poor coordination among stakeholders affects mitigation efforts.	☐	☐	☐	☐	☐
Inadequate supervision affects implementation of mitigation measures.	☐	☐	☐	☐	☐
Limited availability of risk management tools affects project performance.	☐	☐	☐	☐	☐
Institutional capacity constraints hinder effective risk mitigation.	☐	☐	☐	☐	☐

Section F: Recommendations for Improving Risk Allocation and Mitigation Practices

Objective 5: To propose recommendations for improving risk allocation and mitigation practices in public road construction projects in the Elgon Region of Uganda.

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Risk assessment should be strengthened during project planning.	☐	☐	☐	☐	☐
Construction contracts should clearly define risk responsibilities.	☐	☐	☐	☐	☐
Stakeholder participation should be strengthened during contract development.	☐	☐	☐	☐	☐
Training should be provided to improve risk management capacity.	☐	☐	☐	☐	☐
Monitoring systems for road construction projects should be strengthened.	☐	☐	☐	☐	☐
Improved supervision mechanisms can enhance risk mitigation.	☐	☐	☐	☐	☐
Adoption of modern risk management tools can improve project performance.	☐	☐	☐	☐	☐

Strengthening institutional capacity can improve infrastructure project outcomes.	☐	☐	☐	☐	
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APPENDIX II: KEY INFORMANT INTERVIEW GUIDE

Introduction

Good morning/afternoon.

My name is **Ogik Alfred**, a graduate student pursuing a **Master’s Degree in Public Infrastructure Management at Makerere University**. I am conducting a study titled:

“An Assessment of Risk Allocation and Mitigation Practices in Public Road Construction Projects in Uganda: A Case Study of Selected Projects in the Elgon Region.”

The purpose of this interview is to obtain your professional insights on how risks are allocated and mitigated in public road construction projects in the Elgon Region of Uganda. Your responses will help identify challenges affecting risk management practices and propose recommendations for improving project performance.

The information you provide will be treated with **strict confidentiality** and will be used **solely for academic purposes**. Your participation is voluntary, and you may decline to answer any question if you wish.

Thank you for your time and cooperation.

Section A: Background Information

1. What is your current position in relation to road construction projects?
2. Which institution or organization do you work with?
3. How many years of experience do you have in road construction or infrastructure project management?

4. Which districts in the Elgon Region (Bugisu or Sebei) have you worked in during road construction projects?

Section B: Effectiveness of Risk Allocation Practices

5. From your experience, what are the major risks commonly encountered in public road construction projects in the Elgon Region?
6. How are these risks usually allocated among the different stakeholders such as government agencies, contractors, consultants, and local governments?
7. In your opinion, how effective are the current risk allocation practices used in road construction contracts?
8. To what extent do construction contracts clearly define responsibilities for managing project risks?
9. How does the current system of risk allocation affect project outcomes such as cost control, project timelines, and infrastructure quality?

Section C: Challenges Affecting Effective Risk Allocation

10. What challenges affect effective risk allocation in public road construction contracts?
11. To what extent do issues such as unclear contract provisions, limited technical capacity, or political influence affect the allocation of risks in projects?
12. How do institutional or administrative challenges affect the distribution of risks among project stakeholders?
13. In your view, how do procurement processes influence risk allocation in road construction projects?

Section D: Effectiveness of Risk Mitigation Strategies

14. What risk mitigation strategies are commonly used in public road construction projects in the Elgon Region?
15. How effective are these mitigation strategies in addressing risks such as environmental challenges, financial uncertainties, or technical difficulties?

16. How do risk mitigation measures contribute to improving project performance in terms of cost, time, and quality?
17. What role do project planning, supervision, and monitoring play in mitigating risks in road construction projects?

Section E: Challenges Hindering Effective Risk Mitigation

18. What are the major challenges that hinder the effective implementation of risk mitigation strategies in road construction projects?
19. How do factors such as funding delays, environmental conditions, limited technical expertise, or weak monitoring systems affect risk mitigation efforts?
20. To what extent does coordination among stakeholders influence the effectiveness of risk mitigation measures?

Section F: Recommendations for Improving Risk Allocation and Mitigation Practices

21. What improvements would you recommend to strengthen risk allocation practices in public road construction projects?
22. What strategies can be adopted to improve the implementation of risk mitigation measures in infrastructure projects?
23. What policy or institutional reforms are necessary to improve risk management in public road construction projects in Uganda?

Closing Question

24. Is there anything else you would like to add regarding risk allocation and mitigation practices in road construction projects in the Elgon Region?