



JIMMA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

**DEPARTMENT OF CIVIL ENGINEERING (CONSTRUCTION
ENGINEERING & MANAGEMENT)**

**CAUSES OF DELAY IN ROAD CONSTRUCTION PROJECTS &
REMEDIAL MEASURES**

CASE STUDY OF JIMMA-BONGA-MIZAN ASPHALT ROAD

BY
NEGUSSIE EMIRU KASSAHUN

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Jimma University
School of Graduate Studies

Department of Civil Engineering (Construction Engineering &
Management)

Causes of Delay in Road Construction Projects & Remedial
Measures:

Case Study of Jimma-Bonga-Mizan Asphalt Road

A Case Study submitted to the School of Graduate Studies of Jimma University in partial fulfillment of the requirements for the Degree of Master of Engineering in Construction Technology and Management.

By

NEGUSSIE EMIRU KASSAHUN

EXECUTIVE SUMMARY

Ethiopia is one of the developing countries that suffer from shortages in road infrastructures, which are realized through implementing Public Construction Projects. The successful completion of these infrastructures at the time and cost contractually specified is important for social, political and economic developments. These projects however used to encounter considerable time and cost overruns when compared with their planned values. Delays in completion of road construction projects can result in higher costs to owners and contractors, greater inconvenience to the public workers in construction work zones and prolong safety risks to the road users. These situations affect and puzzle not only Practitioners in the field but also Government, policy makers and International Development Financers.

The driving issue for this case study was to address delay issues which challenging task. As a result, the problem statement of this study was shaped and built on causes of delays and their impacts on road construction projects. Three questions were considered in this study to develop the conceptual framework of the problem. These were: Are Road Construction projects executed within the time contractually specified? If not, Why Road Construction projects are not executed within the time contractually specified? And how can this problem be improved? To answer these questions, 17-year Road Sector Development Program of the Government of Ethiopia as the base line.

Past findings were conducted to assess causes of delays based on events that arise during construction stage on the basis either a single criterion such as frequency of delays or delay analysis methods; or a single actor's perspective often focusing on contractor or client. This, as believe of investigators, is short of the project perspective while several stakeholders have stakes in the causes of delays. Thus, this case study designed to take account for both the pre-construction and construction stage events. This include different stakeholders that contribute to delays that helps to formulate a fair approach for the overall apportionment of responsibility for delay to each parties.

Generally, the research falls into a realistic and practical approach. It is realistic because the research was problem centered, occurring frequently, real world practice oriented and trying to see into consequences of actions or contributory relationships in apportionment of the responsibility. It is also practical in that its structure was built upon the contextual, conceptual and methodological frameworks interactively. The study instrument planned to be used is literature review (both primary and secondary data), interviews (with project owner, contractors

and consultants) and case study. Evidences collected were analyzed by discussing the findings and comparing them with the thoughts of different researchers discussed in literature reviews.

Base on this case study, road projects experienced right of way problem that was a prime point for extension of time and cost compensation. Avoiding clearing right of way problems can reduce 80% time compensation and cost overrun.

Finally, the executing agency (ERA) to have most qualified and experienced full time or freelancer to appraise the preconstruction and /or construction phase document to minimize delay in construction projects before project implementation.

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ACRONYMS

ADB	African Development Bank
ADLI	Agricultural Development Led Industrialization
ERA	Ethiopian Road Authority
FDRE	Federal Democratic Republic of Ethiopia
GoE	Government of Ethiopia
IDA	International Development Association
RSDP	Road Sector Development Program
RSDP-I	Road Sector Development Program Phase-I
RSDP-II	Road Sector Development Program Phase-II
RSDP-III	Road Sector Development Program Phase-III
RSDP-IV	Road Sector Development Program Phase-IV
TA	Transport Agency
WB	World Bank

1. INTRODUCTION

1.1 General

Delay is a situation in which a project due to some causes related to the contractor, client, client's consultant or other causes has not been finished in contractual or agreed period. Delays are insidious often resulting in time overrun, cost overrun, disputes, litigation, and complete abandonment of projects [1]. Few projects can be found that the fear of not completing the project on time is not the major concern of the relevant project manager. Hence time performance is one of the key measures of the project success [2] [3] [4] [5]. As some of the causes of the construction delays can be controlled during the life cycle of the project, a significant resource saving can be achieved by identifying and managing better these causes.

A primary goal of Ethiopian Road Authority (ERA) is to serve the public by providing timely construction of highways with the least disruption to the public. A significant annoyance to the public is when important projects are not completed in a timely manner and when the actual progress of the construction work is longer than necessary, thereby prolonging the inconvenience.

One of the most important problems in the construction industry is delay. Even though owners and contractors strive to avoid delays in construction and to minimize the time and costs associated with delays, they often find it difficult to control the circumstances causing delays. Delays occur in every construction projects though the magnitude varies considerably from project to project. Some projects are only a few days behind the schedule; some are delayed over a year. The complexity of projects, incompetence of the implementing agency, complicated schedules and hair-splitting coordination all contribute to the necessity for this attention to time. And when deviations in construction schedules occur — as they invariably do for a variety of reasons — ominous shadows can emerge from behind the clock: delay, acceleration and cumulative impact claims [6]. According to [6], delay and additional cost in construction projects are an inevitable consequence of the risk and uncertainty associated with the execution of any construction project, which is likely to be unique and prototypical in nature [7].

Delay can be divided in to two broad categories: delay to the compilation of the contract itself, resulting from a delay to work which is on the critical path of the construction program, i.e. critical delay, and delay to part of the work which does not cause delay to overall completion, i.e. non-critical delay [10]. The critical delay is the cause for Time Claim, which is either claim by the employer for late completion (liquidated damages) or by the contractor for extension of time and cash compensation. The study by [11] as published in Journal of EER, Vol. 20 revealed that all

international projects being carried out in Ethiopia have not been completed on time; rather all of them have been granted time extension [6]. This and other related literatures indicate that delayed operative tasks generate a cumulative effect, which delays the overall delivery time making efficient time management difficult.

The nature of the work in road projects and the environment in which they are built make such projects susceptible to delay. The influential factors can be:

- High uncertainty associated with such projects because they require excavations in varied soil and site conditions
- Work in these projects depends heavily on equipment and may be delayed because of the need for equipment repair and maintenance.
- Numerous government authorities are involved in the project and each may require the contractor to obtain different permits with restriction on time and work area. A great deal of coordination among these agencies is required to avoid delay.

These factors increase the likelihood of delay in the road project as compared with other public projects. Delays in the completion of highway construction projects can result in higher costs to owners and contractors as well as greater inconvenience to the public workers in construction work zones. Delays can also prolong safety risks to highway users. Therefore, this study focuses on identifying events that cause delay, both in pre-construction and during construction stages; the impacts of delay in terms of time and cost overruns and ways of alleviating problems related with project delay such that benefits of reducing road construction time delay could be achieved.

Delay therefore is an important issue to the construction industry. Investigation in to this problem area is needed in order to better manage delay situations and to mitigate their consequences. So it is essential to define the actual causes of delays in order to minimize and avoid the delays in construction projects. Assessing the actual causes of delay, the extent to which delay may occur and the impacts of delay can provide insights for early planning to control projects delay and improve project performance.

1.2 The Research Objective

The objective of this study is to assess the causes of delay in road construction project and to suggest remedial measures during pre-construction and construction phase of Jimma-Bonga-Mizan road.

Specific Objective:

1. To identify pre-construction and construction stage events that lead to delays.
2. To quantify the extent of delay in project duration with respect to the project original duration
3. To determine the impacts of delay in terms of time and cost overruns
4. To suggest remedial measures on the occurrence of delay.

1.3 The Research Justification

The starting point of any research is the definition of the research issue or the problem statement cited by [12]. This study had also passed through the following specific context:

- Understanding of the issue examined
- Determining the extent of the study focus, and
- Knowledge of the subject area

The research's broad area of the study was related to delays on road construction. This level assisted us to focus on the causes of delay and their impacts on road construction through discussion together with the advisor and reviewing relevant literatures. The specific focused attention has enabled to determine where and which projects should the study include. Besides, it helped to identify the target study project, how data can be collected, and how the interview and the case study can be designed and conducted. In addition, the following question-answer approach was considered helpful to assist these operations in order to formulate the research problem.

Table 1-1 : The Question – Answer Approach

Questions	Answer
Why has the study been established?	Experience showed that most road projects suffer delay and end with time and cost overruns
What does the study try to achieve?	Identify potential causes of delay, the impacts of delay, ways of minimizing delays and preparing information checklist to be exercised by the implementing g agency before project implementation.
Who will benefit from or	Policy makers, External Financers, Consultants, contractors,

Questions	Answer
affected by this study?	Implementing agencies (in this case ERA), Beneficiaries (the society), Regulatory Bodies and Us (Academic Achievement).
Who are considered in the study?	'Parties' in road projects
Why are road projects delays?	Lack of competence, lack of design appraisal team and political interference may cause the problem.

1.4 Research Methodology

The key task in research is to design research process so that the information obtained permits the assessment of their impact. The basic research design was an exploratory research methodology using both primary and secondary data. This design was chosen since it enables to assess the magnitude and scope problems and facilitate for the suggestion of solutions. Generally, the research process was designed through defining the research problems, its objectives and questions. To accomplish these objectives the research was made using the following methodologies:

1. Review the pertinent domestic and foreign literatures, ongoing researches, books, conference proceedings, the Internet, leading construction management and engineering journals and relevant practices related to delays
2. Survey public-sector transportation agency (ERA); construction companies; and consulting engineers to determine the causes of construction delays and methods used to avoid and mitigate delays. The survey was conducted by interviewing the parties involved in three selected ongoing road projects from RSDP-I, RSDP-II and/or RSDP-III exclusive of RSDP-IV.
3. Analyze the causes of delay and their impacts through case study on the Jimma-Bonga-Mizan road project.

2. LITERATURE REVIEW

2.1. Pre-Construction and Construction Events Causing Delays

2.1.1. General

Succeeding, as a project manager requires that you complete your projects on time, finish within budget, and make sure your customers are happy with what you deliver [15]. A guide to the project management body of knowledge defines a project as “a temporary endeavor undertaken to create a unique product or service.” Standing from this definition project is temporary. A project’s duration might be just a week or it might go on for years, but every project has an end date. Through this period it comprises a process. The project time objective specifies the project completion time. Time delays in recovery of damages while early completion might earn rewards. Virtually all road construction projects were not completed as planned. There may be many reasons both foreseeable and unforeseeable, for non-completion of road project timely. In order to complete a project within the required time and budget it is essential that each phase of its preparation and execution, starting with the assessment of feasibility and terminating with the handing over of the completed project by the Contractor to the Owner, be formulated with precision in order to limit delays, disputes and unforeseen additional costs [16]. Ismael Ibrahim classifies a project in to three phases: Project conception, Project design and Project construction. Project conception is the recognition of a need that can be satisfied by a physical structure. The project design phase translates the primary concept in to an expression of a spatial form, which will satisfy the owner’s requirement in an optimum economic manner. Constructions operations are the creation of physical form that satisfies the conception and permits the realization of the design [17]. Taking the idea of Ismael as reference point for the classification of a project, we generally classify events that cause delays in to two:

1. Pre-construction events causing delays during construction stage (this includes events that occur during project conception, project design and project contracting), and
2. Construction stage events causing delays

In this chapter we try to refer to literatures written on pre-construction events causing delays. Construction stage events causing delays will be dealt in the next chapter (chapter 3).

2.1.2. Causes of Delay Due To Events during Pre-Construction Stage

Pre-construction stage is defined as all activities required taking a project from nomination through to advertisement for construction contract letting [18]. The pre-construction process

includes all the activities required to develop a project into the detailed plan specifications and estimates that are used by contractors as their construction plan. This is a very complex process that is performed by several management units. For large projects, the process from start to finish can take over 10 years. The process involves many different engineering disciplines and functional areas of expertise that include: project management, highway design, structural engineering, hydraulics, environmental engineering, traffic engineering, right-of-way, utilities, environmental analysis and others [18]. The project manager and implementing agencies must allow sufficient time to complete all the essential pre-construction activities in the overall project schedule in order to minimize the possible delays and cost overruns encountered during implementation stage.

The causes of delay and cost overrun arising from pre-construction stage that lead to claims and disputes are resulted due to the existence of high uncertainty during the early phase of a project, which possess the most probable influencing power on the project [19]. Decisions made early in the life of the project have the most profound effect on the project's objectives of delivering a safe, quality project within the time and budget allocated [20].

The literature discusses some of the possible reasons why some construction contracts do not achieve the original program to completion, the execution of the works on time and within budget. These reasons are:

- The Employer's choice of risk allocation does not place risks with the party best placed and motivated to manage that risk.
- The design is not complete or subject to late change and additions
- The overall duration of the contract program is not realistic
- Activity duration may be unrealistic
- There is lack of clarity in the declaration, ownership and use of 'float', both within activity durations and in the period between the contractor's intended date for completion and the Contract Completion Date
- Available site resource levels have not been considered in the program
- The lack of resources further down the supply chain
- The program network does not respond realistically to changes
- The reporting of progress is neither objective nor measurable
- The contract conditions do not encourage open discussion on progress between the Employer and the Contractor.

The major events that may result in delay arising from pre-construction stage are:

1. Contract document preparation
2. Design preparation
3. Tender document preparation
4. Process of tendering
5. Contract negotiation process

2.2. Causes of Delay during Construction Stage

2.2.1. General

Factors that cause delay during implementation stage may result in additional cost to both the client and the contractor. The loss of revenue or benefit that could have been gained if the project was completed on time, consultant fees which are paid throughout the project, cost associated with head office support of the project are among the costs to be cited as the major ones incurred by the employer. Similarly, the additional cost to be incurred by the contractors include: additional overhead costs, costs of extension of various bonds such as performance bond and bank guarantee, operational and maintenance cost of facilities [11].

The main aim of this chapter is to set out the various causes of delay on road projects at implementation stage, which may lead to extension of time and cost overruns, FIDIC 87 provisions for delay responsibilities, and sources of information to assess causes of delays and their impacts. But before that it is better to discuss types of delays to better understand the cause and effect relationship among the different causes of delays.

2.2.2. Types of Delays

According to Syed M. Ahmed and Salman Azhar, delays can be grouped in to the following four broad categories according to how they operate contractually [32]:

Types of Delays

- None-excusable delays
- Excusable non-componsable delays
- Excusable componsable delays
- Concurrent delays

2.2.3. Non-Excusable Delays

Non-excusable delays are delays, which the contractor either causes or assumes the risk for. These delays might be the results of underestimating of productivity, inadequate or scheduling or mismanagement, construction mistakes, weather, equipment breakdowns, staffing problems, or mere bad luck. These delays are inherently the Contractor's responsibility and no relief is allowed. These delays are within the control of the contractor or are foreseeable; however, it is not necessary that they be both [32]. In general, if the delay is found to be non-excusable, then the contractor gets no time or money and pays liquidated damages [15].

2.2.4. Non-Compensable Excusable Delays

When delay is caused by factors that are not foreseeable, beyond the contractor's reasonable control and not attributable to the contractor's fault or negligence, it may be "excusable". This means that neither party is at fault under the terms of the contract and has agreed to share the risk and consequences when excusable events occur. The contractor will not receive compensation for the cost of delay, but he will be entitled for an additional time to complete his work and is relieved from any contractually imposed liquidated damages for the period of delay [14]. Sami M.Fereig and Nabil Karatam also strengthen the idea of Syed M. Ahmed and Salman Azhar stating that a contractor gets time, but not money if Non-compensable Excusable delays occur, but he is relieved from liquidated damage [20].

According to Scott A. Aftuck a delay must be excusable in order to be the basis for an extension of time or additional compensation. However, at times, even if a delay appears to be excusable, it will be the responsibility of the contractor if it was foreseeable; it could have been prevented but for the acts of the contractor, or it was caused by the negligence of the contractor [33].

2.2.5. Compensable Excusable Delay

In addition to compensable delays that result from contract changes by Change Notice, there are compensable delays that can arise in other ways. Such compensable delays are excusable delays, suspensions, or interruptions to all or part of the work caused by an act or failure to act by the owner resulting from owner's breach of an obligation, stated or implied, in the contract. If the delay is compensable, then the contractor is entitled not only to an extension of time but also to an adjustment for any increase in costs caused by the delay [32]. In short, a contractor gets both time and money when Compensable Excusable delays occur [20].

Scott A. Aftuck pointed out that if the delay could have been avoided by due care of one of the parties, the party, which did not exercise such care, is responsible for the additional costs. The contractor may be liable for the negligent acts of its subcontractors. However, if the subcontractor has a direct contractual relationship with the owner of the project, the contractor most likely will be able to recover damages, as it was not in a position to prevent the delay [33].

2.2.6. Concurrent Delays

In some publications (JJJ, 1992; Mastrandria 1992 as quoted in David W. Bordoli and Andrew N. Baldwin, 1996) it has been suggested that the prime difficulty with concurrent delay is giving its clear definition. No attempt will be made here to strictly define concurrency other than, from the definition, more than one delay happens at the same time. The problem seems to decide which of the delays, if any, results in delay to the completion of the project and, if there is a multiplicity of causes, if the contractor is to recoup loss and expenses [34].

Brian Eggleston describes that disputes related to concurrent delay arise not so much on how long was the period of the overlap, but to what cause should it be attributed; and to what extent it is permissible to consider the knock-on effects of one delay to another. There are three principal approaches to the solution of the problem: the first in line approach, the dominant cause approach and the appointment approach [35].

The method only takes cognizance of the events that affect activities on or near the critical path (the time of the delay) that result in the project delays. In analyzing delay in chronological sequence, the earlier event causes the delays that result in the following event having no additional effect on the project completion [34].

2.3. Occurrence of Construction Delay

A project consists of collections of activities. Jonathan Jingsheng Shi, S. O. Cheung and David Ardit say that an activity's completion may be delayed due to a delayed start or extended activity duration. While an activity's start may be delayed due to certain reasons, its duration may be extended due to some other reasons. An activity's delayed completion may cause delays in the succeeding activities, which in turn can cause a delay in the project completion.

Delays can occur in any and all activities, and these delays can concurrently or simultaneously cause delays in the project completion. In other words, a project delay is the accumulated effect of the delays in individual activities [36].

2.3.1. Identification of Causes of Delay

According to Syed M Ahmed and Salman Azhar, there are two kinds of causes of delays in construction projects: external and internal causes. Internal causes of delays include the causes, which come from four parties involved in the project- Owner, Designer, Contractors, and Consultants. Other delays, which do not come from these four parties, are based on external causes for instance from the government, material suppliers, weather [33]. They pointed out that causes of delays that the construction industry is facing nowadays during implementation stage are:

- Possessive decision-making mechanism
- Highly bureaucratic organization
- Improper inspection approach
- Different attitude between the consultant and contractor
- Financial difficulties
- Inexperienced personnel
- Insufficient number of staff
- Deficiency in project coordination
- Inadequate and old equipment
- Lack of high technology equipment
- Harvest time

They classified these causes of delays in the following broad categories depending on their nature and mode of occurrence:

Table 2-1.Categories of delays according to their nature and mode of occurrence

Categories	Causes of delay
ACTS OF GOD	<ul style="list-style-type: none"> • Flood • Hurricane • Fire • Wind damage
	<ul style="list-style-type: none"> • Change order

Categories	Causes of delay
DESIGN-RELATED	<ul style="list-style-type: none"> • Change in drawings • Change in specifications • Shop drawings approval
CONSTRUCTION-RELATED	<ul style="list-style-type: none"> • Inspection • Subsurface soil condition • Material/fabrication delays • Material procurement • Lack of qualified craftsmen • Poor subcontractor performance • Defective work • Different site condition • Damage to structure • Construction mistakes • Poor supervision • Equipment availability
FINANCIAL/ECONOMIC	<ul style="list-style-type: none"> • Financial process • Financial difficulties • Delayed payments • Economic problems
MANAGEMENT/ADMINISTRATION	<ul style="list-style-type: none"> • Labor dispute and strike • Inadequate planning • Inadequate scheduling • Contract modification • Underestimation of productivity • Staffing problems • Lack of coordination on site

Categories	Causes of delay
	<ul style="list-style-type: none">• Scheduling mismanagement• Transportation delays• Suspensions• Inadequate review• Lack of high technology• Poor management skill

Source: Syed M. Ahmed, Salman Azhar and Mauricio Castillo, Construction Delays in Florida: an Empirical study, Florida International University, USA, 1999

According to FIDIC 87, delays in construction work mainly occurring during implementation stage are due to [37]:

- Delay in site hand over.
- Late approval of payment certificates.
- Changing the scope of the work.
- Low contractor's financial and technical capacity.
- Delay of drawings or instruction.
- Unforeseeable physical condition.
- Suspension of work up on the engineer's instruction.

W. Trench Frics classified the above causes of delays as [38]:

1. Delays caused by the Contractor
2. Delays caused by the Client
3. Delays caused by the Consultant
4. Delays caused by outside the control of either party to the contract

2.3.2. Delay Caused by the Contractor

One of the contractor's obligations in contract is to complete the work in the date specified in the contract documents, but if he fails to complete the work by his default, he would be liable to compensate the owner as liquidated damage [38].

According to KK Chitkar, the contractor's default results in due to lack of proper project management during execution. Projects like road comprise various interrelated constituents such as: - Resources, tasks and technology along with the people working in the project, which combine together to achieve the common objectives. Inappropriate way of managing all these constituents may lead to delay of the project [39].

2.3.3. Delay Caused by the Client

The client delays completion of the work in various ways. Among these, the following are the main ones as a report published by the construction industry council of UK [41]:

- Rigid budgets
- Changes of mind during construction
- Ordering extra which delay the work
- Delay to provide the right of way
- Differing site conditions
- Suspension

These all are fairly common situations in construction works as a result most condition of contracts contain provisions to allow an extension to the contract time to cover reasons where the client has affected the completion of the works [38]. One of the principal causes of project delay and cost overruns is that contracts are awarded and notice to proceed given before all arrangement for the contractor to take possession of the site and proceed, as called for in the contract, are completed. As a consequence, contractor may encounter impediments that lead to delay and claims.

2.3.4. Delay Caused by the Consultant

According to Edward R Fisk, the major causes of delays that are caused by the consultant side include the following [24]: -

- Late approval of laboratory tests.
- Design changes.
- Late approval of payment.
- Poor briefing of document (i.e. specification, bill of quantity.).
- Postponement of work.

Late approval of shop drawings can be major causes of delay on construction projects which require a clause in the contract stating the timing required for submission and approval of drawings [42].

2.3.5. Delay Caused by outside the Control of Either Party to the Contract

Because of the way construction works are carried out, there will be many occasions, which are beyond the control of either party that may lead to delay. Most construction contracts including FIDIC red book (1987) incorporate provision to grant extension to the completion date to cover these situation. According to W. Trench Frics, events [38], which considered as outside the control of either party to the contract, are: -

- Force majeure.
- Exceptional adverse weather condition.
- Civil commotions or strikes use of fuel or labor.
- Material market instability.
- Government legislation change.
- Government statutes that restricts use of fuel or labor

3. CASE STUDY ANALYSIS AND DISCUSSION

3.1. General

Among the many completed and/or ongoing road projects that were under taken through ERA, two of them are selected for the case study. The selection of the projects is based on the availability of the projects data. The background data and primary information of these projects are given below. The causes of delay, contractor's extension of time claims and the engineer's recommendation are discussed in detail in the discussion part of this chapter.

3.2. Jimma-Mizan Road Upgrading Project (Contract 1: Jimma-Bonga Junction)

3.2.1. Project Information

Project name	: Jimma-Mizan Road Upgrading Project (Contract 1: Jimma-Bonga Junction)
Project length	: 113.122 km
Type of construction	: Upgrading
Contractor	: Keangnam Enterprise Ltd. of South Korea
Consultant	: LEA International Ltd, Canada In Joint Venture with LEA associates South Asia Pvt. Ltd. India and Core Consulting Engineers Plc., Ethiopia
Employer	: Ethiopian Road Authority (ERA)
Financer	: African Development Bank (AfDB) and : Government of Ethiopia (GoE)
Commencement date	: April 21, 2008
Scheduled completion date	: February 20, 2011
Actual completion date	: February 2014
Original Contract Price	: ETB 686,102,036.19
Revised Contract Price	: ETB 696,809,155.03
Current status	: Completed

3.2.2. Findings

The table below entails the summary of submitted extension of time claims, and the engineer recommendation for Jimma-Bonga Upgrading project.

Table 3-1: Summary of extension of time claims for Jimma-Bonga Upgrading road project

No	Causes of claim	Reasons giving rise to extension of time claims	The contractor's Extension of time claims	The Engineer's recommendation
EOT-1	Missed data	Missed data	228 days	Nil
EOT-2	Site possession & access of site	Unable to access the site	302 days	Nil
EOT_3	Variation	Construction of Minor Cross Drainages	103days	Nil
EOT-4	Adverse Weather Condition	Unable to perform as planned	Initially 130 days Second time-32 days	Nil 15 days
EOT-5	Shortage of Cement	Unable to perform as planned	216 days	Nil
EOT-6	Variation	New Item of Work	550days	Null and Void
EOT-7	RoW and Variation	Obstruction and change order	304 days	79
EOT-8			287 days	Nil
EOT-9	Site Possession	Unable to access to quarry site	79 days	Nil
EOT-10	Obstruction	Unable to perform as planned	437 without under cut or 520 with under cut	150 days
Total			2,636days	244 days

Details of time extension claims and their causes

The project's initial cost was **Birr 686,102,036.19**, and it was expected to be complete in **34 months**. But due to several reasons the project got completed in **70 months with a total project cost of Birr 696,809,155.03**. Due to different issues the project slips for **105%** with cost overrun of nearly **Birr 10,707,118.84**. This is equivalent to implementing a new project!

The contractor submitted over ten issues that were directly related to time extension. Among these obstruction (unable to perform as planned) and RoW are the main causes for the delay.

3.3. Jimma-Mizan Road Upgrading Project (Contract 2: Bonga-Mizan Junction)

3.3.1. Project information

Project name	: Jimma-Mizan Road Upgrading Project Contract 2: Bonga - Mizan Junction
Project length	: 119.17 Km (Including 6.594Km Bonga-Realignment)
Type of construction	: Upgrading of the existing road
Employer	: Ethiopian Roads Authority (ERA)
Contractor	: Keangnam enterprise limited of South Korea
Engineer	: International Consultants and Technocrats Private Ltd. (ICT) in association with Transcom Technologies Ethiopia Ltd. (TCTEL) & International Consultants and Technocrats Ethiopia Private Ltd. (ICTE)
Financier	: African Development Bank (AfDB) and Government of Ethiopia (GOE)
Contract signing date	: xxxxxx
Contract commencement date	: 23 rd April 2008
Original time for completion	: 22 nd February 2011
Contract price	: ETB 742,938,845.66 Payable in the proportion of 38.78% ETB and 61.22% Foreign Currency
Revised Contract Sum	: ETB 747,269,898.54
Current status	: Ongoing /Completed/

Actual completion date : 29 June 2015

3.3.2. Findings

The contractor has formally submitted the under listed six applications for extension of time for completion.

Table 3-2 summary of extension of time claims for Bonga-Mizan Upgrading Road project

No	Causes of claim	Reasons giving rise to extension of time claims	The contractor's Extension of time claims	The Engineer's recommendation
EOT-1	Contractor claimed EOT on May 3,2010		211 days	Nil
EOT-2	Contractor claimed EOT on March 01,2011		313 days	Nil
EOT-3	Unforeseen conditions	Unavailability of suitable material	Not mentioned	Evaluated
EOT-4	Unforeseen conditions	Exceptional adverse weather condition	142 days	23 days
EOT-5	Variation order No-7	Change order	247 days	37 days
EOT-6	Unforeseen conditions and Variation Order No-9	Land slide and Mizan town extension	271 days	Waiting Employer approval
Total			1,184days	60days

Details Of Time Extension Claims And Their Causes

The project's initial cost was Birr 742,938,845.66 and it was expected to be complete in 34 months. But due to several reasons the project got completed in 86 months with a total project cost of Birr 747,269,898.54. Due to different issues the project slips for 152% with a cost overrun of Birr 4,331,052.90. This is more than implementing a new project!

The contractor submitted over six issues that were directly related to time extension. Among these variation order (change order) and adverse weather conditions are the main causes for the delay.

The total extension of time determined by the engineer and subsequently granted to the contractor is 60 days. This is 5.07% of the total extension of time claimed by the contract

3.4. General Discussions

Delays that occurred during the construction stage of the projects could be attributed to causes from both during pre-construction stage and the construction stage. According to the result of the case study of the two projects, the predominant cause of delay is Right of Way (RoW) i.e. not clearing obstruction and adverse weather conditions. From the total causes of delay that happened in the projects, RoW take more than 47% of the total causes.

Employer's risks that can be attributed to; site security, failure to give possession of sites, and unforeseen conditions are the pre dominant causes of delay for the projects. To avoid right of way problems, the government and private institutions should create awareness in the society to facilitate right of way issues before the start of execution process.

Exceptional adverse weather conditions are also identified as a cause of delay.

4. CONCLUSION AND RECOMMENDATION

4.1. Conclusion

The study indicate that delays in road construction projects occur mostly to the events arise from the pre-construction activities. Pre-construction events causing delays in road construction is attributable to the project owner (ERA) and Designer and/or the consultant.

One of the pre-construction problems causing delays due to owner related defaults is poor contract formulation whereas the problem associated to the consultant is mostly related to design problems, bill of quantities, preparation of drawings and specifications, tender and bidding document preparations and process of tendering.

Major delays to the events in implementation stage occurred in road construction projects are attributed to the three parties involved in the projects (owner (ERA), Contractors and consultants.

Delay to remove obstructions and provide the right of way, change of mind during construction and ordering extra works are the major ones attributed to owner of the project.

Lack of experience in road construction projects; lack of skilled and key personnel to carry out the works; failure to mobilize plant and equipment and personnel at the right time and location; opening too many fronts beyond its management and resource capacity; failure to hold realistic work plan and schedule and lack of awareness about the specification and sufficiency of tender document are attributed to the contractor.

Delaying approval of drawings and failure to give written instructions and specifying unachievable specifications are the major problems committed by the consultant during the implementation stage.

4.2.Recommendation

Based on the analysis and the findings of the study, the following recommendations are forwarded.

The recommendations are aimed at the government institutions, running professional engineers as well as practicing professionals and consultancy firms with the view of minimizing the causes of delays and their impacts.

The Client should enforce a mandatory pre-qualification of contractors for major civil engineering projects, particularly road sector, will assist in weeding out less experienced contractors, and encourage the participation of more qualified ones.

The consultant should thoroughly consider all variables that are needed to design the planned roads according to the standard and quality of the required grade. The amount, detail, and accuracy of the design data collected should be commensurate with the standard of the road and with the values, resources and risk associated with the project.

Contractors must prepare workable plans by identifying the critical items during planning; understanding and operating procedures, taking timely decisions, and incorporating appropriate planning tools and techniques.

Finally, but not the last and the least by no means, the owner of the project is advised to appoint ‘Risk Manager’ who has a reasonable level of programing skill and involve both in the pre-construction and construction stages of the project to minimize causes of delay.

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APPENDIX

Semi Structured Interview Questions to Parties in Road Sector.

1. General about the project

1.1 Project name?

1.2 Parties in the project?

1.2.1 Owner

1.2.2 Contractor

1.2.3 Consultant

1.3 Total length of the project?

1.4 Project type?

1.4.1 Construction of new road?

1.4.2 Up grading of the existing road?

1.4.3 Rehabilitation of the existing road?

1.4.4 Maintenance of the existing road?

1.5 Carriage way finishes?

1.5.1 Asphalt concrete?

1.5.2 Gravel?

1.6 Project financiers?

2. Brief description of the original project schedule

2.1 Project commencement date?

2.2 Contract period of the project?

2.3 Original completion time?

3. What percent of the work is completed?

4. What percent of the work would have been completed according to the approved work program?

5. Is the actual progress of the work lagging behind the schedule or ahead of the schedule?

6. Is the actual progress of the work is ahead of the original schedule, what are the critical success factors? (If any)

7. If the actual progress of the work is lagging behind, who is responsible for the delay?
 - 7.1 The owner?
 - 7.2 The consultant?
 - 7.3 The contractor? Or
 - 7.4 Reasons outside the control of the parties? (If any)
8. If the owner is responsible for the delay, what are the defaults that led to delay of the project?
 - 8.1 Failure to remove obstruction and give possession of site?
 - 8.2 Ordering extra which delay the work?
 - 8.3 Failure to make certified payment within specified time?
 - 8.4 Monition if there were any other defaults?
9. At what stage did the default the owner happen?
 - 9.1 At pre construction stage? Or
 - 9.2 During construction stage?
10. If the contractor is responsible for the delay, what are defaults that led to delay?
 - 10.1 Failure to hold cash flow forecast?
 - 10.2 Failure to hold realistic and updated work plan and schedule?
 - 10.3 Failure to mobilize plant and equipment's at the right time
 - 10.4 Failure to allocate skilled and unskilled manpower at the right time and location?
 - 10.5 Failure to attain the required specification of the work?
 - 10.6 Failure of specified suppliers to supply materials on time?
 - 10.7 Opening too many fronts beyond its management capacity?
 - 10.8 Failure to mobilize resources within the specified mobilization period?
 - 10.9 Mention if there were any other defaults?
11. At what stage did the default the Contractor happen?
 - 11.1 At pre construction stage? Or
 - 11.2 During construction stage?
12. If the consultant is responsible for the delay, what are defaults that led to the delay?
 - 12.1 Delay in approving designs?
 - 12.2 Giving erratic information?

- 12.3 Non-approval of the contractor's authorized representatives?
 - 12.4 Approving designs without thoroughly reviewing?
 - 12.5 Failure to be available at the right time to approve commencement of a task?
 - 12.6 Postponement of any work?
 - 12.7 Mention if there were any other defaults?
13. At what stage did the default the Consultant happen?
- 13.1 At pre construction stage? Or
 - 13.2 During construction stage?
14. Were there any causes of delay outside the control of the parties? What were they?
- 14.1 Force majeure?
 - 14.2 Exceptional adverse weather conditions?
 - 14.3 Civil commotions or strikes affecting the works?
 - 14.4 Government statues that restricts use of fuel or labor?
 - 14.5 Materials market instability?
 - 14.6 Government legislation change?
 - 14.7 Mention if there were any other defaults?
15. For what type of delay claim for extension of time was requested and approved?
16. For what types of delay claim for liquidated damages were requested and approved?
17. Are there any claim raised by either party in relation to delay?
18. What actions have been taken to avoid delays?
19. When do you think the project is completed?