ADDIS ABABA UNIVERSITY

CAUSES OF PROJECT COST OVERRUN AND TIME DELAY:

The Case Of Afar Sustainable Development Goals Program Office Projects.

BY: FITSUM BULLO KEBELO

JUNE, 2018

Addis Ababa, Ethiopia

CAUSES OF PROJECT COST OVERRUN AND TIME DELAY: THE CASE OF AFAR SUSTAINABLE DEVELOPMENT GOALS PROGRAM OFFICE PROJECTS.

By: Fitsum Bullo

(ID No : GSD/0548/07)

Advisor: Abdurezak Mohammed(PhD)

A Research Project Work Submitted to Addis Ababa University school of Commerce in Partial Fulfillment of Award of Masters Degree in Project Management(MAPM)

June, 2018

Addis Ababa, Ethiopia

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

MASTERS OF ARTS DEGREE PROGRAM IN PROJECT MANAGEMENT

CAUSES OF PROJECT COST OVERRUN AND TIME DELAY: THE CASE OF AFAR SUSTAINABLE DEVELOPMENT GOALS PROGRAM OFFICE PROJECTS.

By

Fitsum Bullo Kebelo

Approved by Board of examiners:

External Examiner **ARGAW ASHA(PhD**) Signature---------- Date----------

Internal Examiner **MEGISTU BOGALE(PhD)** Signature----------Date----------

Advisor **ABDUREZAK MOHAMMED(PhD)** Signature---------- Date------

DECLARATION

I declare that this project work entitled "**CAUSES OF PROJECT COST OVERRUN AND TIME DELAY: THE CASE OF AFAR SUSTAINABLE DEVELOPMENT GOALS PROGRAM OFFICE PROJECTS**" is my original work. This project work has not been presented for any other university and is not concurrently submitted in candidature of any other degree, and that all sources of material used for the thesis have been duly acknowledged

Name: Fitsum Bullo Signature: _____

ACKNOWLEDGEMENTS

First of all I would like to thank the Almighty God, Who gave me the commitment and tolerance to pass various obstacles and come up to the accomplishment of this project work.

I am deeply indebted to my advisor, Abdurezak Mohamed (PhD), from Addis Ababa University, College of business and economics, school of commerce. I want to thank him for giving me a step up energy on my confidence to accomplish the project work and kindness and invaluable comments.

I am also deeply grateful to all my postgraduate instructors who deserve great thanks since their inputs are worthwhile. I would like to express my special feeling to Marchip Mengistie who is my dear friend, as he is pushing me towards my goals and a brother in love.

I would like to express my appreciation to all ministry of agriculture and livestock resource personnel, especially SDG program office personnel who contributed directly or indirectly and provided the necessary materials and support for the realization of this project work.

I owe my deepest gratitude to my wife Etalem Gizaw without her care, support and love, this achievement would not have been realized.

CONTENTS **Pages**

Annex **Pages**

LIST OF ABBREVIATION

SDG : Sustainable Development Goals

GTP: Growth Transformation Plan

MOA&NR: Ministry Of Agriculture And Natural Resource

MOA&LR: Ministry Of Agriculture And Livestock Resource

MOFEC: Ministry Of Finance And Economic Co-Operation

G.C.: Gregorian Calendar

E.C.: Ethiopian Calendar

PMBOK: Project Management Book Of Knowledge

PMI: Project Management Institute

MOSPI: Ministry Of Statistics And Program Implementation Of India

SPSS: Statistical Package for Social science

List Of Table

ABSTRACT

Most water related construction projects in Ethiopia frequently face cost overrun and time delay. The objective of this study is to identify the major causes of cost overrun and time delay and thus help in avoiding them by identifying measures that should be undertaken in project management using a questionnaire. And this survey shows the client projects personnel perspective. The survey questionnaire constitutes a collection of thirty six(36) causes found in the literature, classified into two(2) groups namely cost overrun and time delay causing factors. The questionnaire were answered by thirteen (13) purposely selected SDG program office personnel and horizontal program office horizontal officers which involved with all the SDG program projects implemented from July 2008 E.C. to February 2010 E.C time duration. The respondents are requested to rate the thirty six(36) causes identified from literature review, add if there is any additional causes that are not included in the questionnaire and measures to be taken to manage the causes. Here the Relative Importance index (RII) method is used to rate according to their importance of each causing factors listed in the questionnaire after the data reliability is checked. According to this study Design change, scope change, ineffective project monitoring, and ineffective program management are the major time delay causing factors. And original estimate and budgeting, design changes/iteration, inadequate availability of skilled resource and location or/and connectivity of project site are the major cost overrun causing factors. Lastly the study identifies six area of project to be dealt to manage or control the effect of cost overrun and time delay. These are project scoping & planning, project monitoring & control, program office projects management, capacity building, project communication and risk management.

Key words: cost overrun and time delay, causes , manage and control, RII

CHAPTER ONE: INTRODUCTION

1.1 Background Of The Study

Leaders from 193 countries created a plan called the Sustainable Development Goals (SDGs). This set of 17 goals imagines a future just 15 years off that would be rid of poverty and hunger, and safe from the worst effects of climate change. It's an ambitious plan. Political leaders and policymakers have more ambitious goals, with a number of countries explicitly stating the goal of becoming middle income countries within 20 years. Specific sustainable development goals and targets as well as indicators intended to inspire focused and accelerated actions were propose.(UNDP:SDG booklet web)

Among the seventeen sustainable development goals, goal number 6(clean water and sanitation) ensure availability and sustainable management of water and sanitation for all, has an objective of everyone on earth should have access to safe and affordable drinking water. That's the goal for 2030. While many people take clean drinking water and sanitation for granted, many others don't. Water scarcity affects more than 40 percent of people around the world, and that number is projected to go even higher as a result of climate change. If we continue the path we're on, by 2050 at least one in four people are likely to be affected by recurring water shortages. But we can take a new path—more international cooperation, protecting wetlands and rivers, sharing water-treatment technologies—that leads to accomplishing this Goal. With this regard the SDG program in Afar regional state is formulated to undertake water related projects. These projects can be classified broadly in to three main types. These are surface or ground water based irrigation projects, surface or/and ground water based water supply projects and capacity building for scheme construction and operation management projects.

As a base line, the east African region is characterized by heavily affected by insufficient land resources, challenged by unsustainable food security for all, with inadequate levels of food, both quantity and quality wise and environmental sustainability continues to be weak in the region. Hence countries like Ethiopia in the region should need to commit themselves to mobilize and allocate increased share of public financial resources to sustainable development, sustainable development should be effectively mainstreamed into national development policies, strategies and programs, countries should also establish platforms to enable sharing experiences and scaling-up of sustainable development best practices, formal and non-formal education and sensitization on sustainable development should be strengthened, policy and incentive schemes should be established and promoted to enable the private sector to actively participate in sustainable development and collaboration and coordination among various organizations within and outside the region should be strengthened to harmonize interventions.(united nation economic for Africa & UNDP, 2015,2016)

The government of Ethiopia formulated a Growth Transformation Plan of the second generation (GTP-2) which align with the SDG's (sustainable development goals) in the country, specifically in Afar region. The Sustainable Development Goals (SDG) program projects in ministry of agriculture and livestock resource (MOA&LR) are interventions which aim to addresses the problems associated with the livelihood of pastorals in Afar regional state. In this region people suffer from lack of basic services like health, school, and clean water. This is basically because the community living in this area are frequently moving from place to place in search of water for them and their cattle's which their life mostly depend on. And with this community mobility condition, it is difficult to provide the above mentioned basic services. Hence, the regional government selects settlement sites and the appropriate basic services are

provided and going to be provided through the regional bureaus as well as the federal institutions, like MOA&LR under SDG projects program office. The federal level SDG program intervention is concerned of water related projects: these include deep well drilling, water supply scheme construction, irrigation scheme construction, capacity building activities (for efficient and effective construction of the schemes and operational management) and related construction activities like electric power, roads and offices (Ministry of agriculture & livestock resource, 2016).

In doing so, the community is supposed to be self sufficient in food production and clean water supply by the only regional intervention effort. But in actual situation it demanded the previously mentioned federal and regional collaborated program to meet the self sufficiency gap. The project finance source is the federal democratic republic of Ethiopia, ministry of finance and economic cooperation (MOFEC), a special budget for regions for sustainable development goals which is part of originally allocated by the federal government of Ethiopia as supporting capital budget for all regions and one town administration in the country. And this budget, allocated for Afar region, is given to the federal ministry of agriculture and livestock resource (MOA&LR) to represent the region as a client, to handle the SDG's projects. The program office launched the SDG program starting from 2008 E.C and will end up at 2012E.C. The program office projects budget for each year of 2008 E.C. and 2009 E.C. was 374 million Eth. Br., and in 2010E.C. is reduced to 211.4 million Eth. Br. (Ministry of finance & economic cooperation, 2018).

1.2 statement of the problem

Kerzner (2009) states successful project management can then be defined as having achieved the project objectives: Within time, Within cost, At the desired performance/technology

level, While utilizing the assigned resources effectively and efficiently and Accepted by the customer.

Shah(2016) explained Delay and cost overrun are the key problems of any construction projects. These issues are causing the negative impact on the development of country economic growth and prosperity. And also depicts that there are diverse groups of delay factors from one country to another country that cause the project delay and cost overrun. It also concludes that there are diverse measures according to the nature of delay factor and are necessary to reduce the impact on project delay and cost overrun in the construction industry in both developed and developing countries. Here SDG program projects implemented by ministry of agriculture and livestock resource in Afar regional state were in problem, with respect to the fact that projects were not completed on time and within budget. As a result of this situation the number of projects implemented in each budget year became smaller. And the benefits from the projects that should be addressing the beneficiary become late and create discomfort among the beneficiary. In the meanwhile the projects in the SDG program are often completed with an additional budget and extra time and therefore dissatisfaction among the stakeholders is prevalent.

Several studies have addressed many different factors that cause overruns in different types of development construction projects. Consistent cost overrun and time delay of public projects are not the best use of taxpayer money. In the current economic situation where tax revenues are lagging, they are particularly detrimental. Even if the quality of original approved plan of different projects in sustainable development goals program should be questioned, in this specific SDG program office projects cost and time performance is in question. Here, the number of projects conducted in each year is less than the approved plan at the beginning of the budget year due to budget and time shortage encountered as many projects consuming more money and time. For example the SDG program office planned to implement thirty one(31) and twenty

seven(27) projects in 2008 and 2009 respectively whereas the office achieved implementing fourteen(14) projects in 2008 and seventeen(17) projects in 2009 because of the project cost overrun and time delay.

And as Sheathe (2013) explained, in the public sector, money spent on project change orders and increased construction time reduces the number and size of the projects that can be completed during any given fiscal year. One of the main objectives and policies of any public or private sectors dealing with the execution of projects is to upgrade projects performance, through reduction of costs, completion of projects within their assigned budget and time constraints, and improve quality.(Al-Najjar, 2008).

To tackle the extra unplanned expenditure of cost and time, it is worth taking to identify the major causes of cost overrun and time delay to deal them with efficient and effective resource utilization. But in contrast SDG projects of MOA&LR, implemented in Afar regional state, there is no study conducted concerned about cost overrun and time delay.

1.3 Objective Of The Study

Since the program is part of the country's agricultural sector GTP II plan, this project work is intended to put an effort in identifying not only the major causes of cost overrun and time delay but also an efficient and effective means of minimizing a cost overrun and time delay of projects for the forthcoming program endeavors and similar projects.

The study focuses on identifying the causes or that have a major impact on the projects performance which need a serious attention to deal with and the respective recommendations that should be undertaken. Even if some causes may be common to all projects in all sector but there is a specific causes to SDG projects that demands a special attention to manage.

The following are the objectives of the study

(1) Identifying the major causes of Project cost overrun and time delay within the project client MOA&LR perspective;

(2) Formulate recommendations for the improvement of project cost and overrun within the project/program office perspective;

1.4 Basic Research Question

This section encompasses the questions the researcher wants to ask to shape the study. Based on the above model, the researcher wants to ask the following research questions:

1. What are the causes and of cost overrun and time delay on sustainable development goals projects (SDG) ?
2. What are the appropriate measures to manage cost overrun and time delay in the program office projects?

1.5 Significance Of The Study

The primary purpose of development projects are to optimize quality, cost and time; and hence this study targets identifying the causes of time and cost overruns and brings the managing means of these causes. The research output can be used for the forth coming SDG program intervention as lesson learned to tackle time delay and cost overruns.

Consequently, the significance of this study is to identify major cost overrun and time delay and recommend practices, procedures and methods that can be used to minimize or avoid time delay and cost overruns of SDG projects; and to handover or deliver development projects to the client within the given time and cost specified on the contract document. Therefore, the result helps ministry of agriculture and livestock resource, Afar region water bureau, Afar region pastoralists agriculture bureau, and other institutions and individuals who has a concern on how

to manage projects effectively and efficiently with respect to project cost and time in future Ethiopian water related sustainable development goals projects.

Moreover, as of now most infrastructure projects in Ethiopia, as in the case of the SDG program projects, are funded by taxpayers' money. Therefore, taxpayers have the right to know how efficiently their money is being utilized by the officials while providing for public goods and services. Indeed, inadequacy of research on the subject is somewhat surprising and reflects a gross neglect of an important public policy subject.

Finally since the study explores the major cost overrun and time delay causes and their managing recommendation, it presents a robust background on the theories of project cost overrun and time delays.

1.6 Scope Of The Study

According to Sun (2010) and Devaya (2008) as cited by Eliufoo(2017) who admit that although the causes of cost overrun in projects share common characteristics worldwide, they are also affected by country-specific conditions such as political, economic, legislative, social and cultural actors. The study hence has attempted to make sustainable development goals program in ministry of agriculture and livestock resource a case specific, though acknowledging the fact that the results have a wider application to similar scenarios.

Hence, the research focuses on identifying the causes which have a major impact on the project's success, with respect to delay and cost overrun, of the sustainable development goals (SDG) projects in ministry of agriculture Addis Ababa program office. The study includes projects conducted within the period of starting from July 2007 E.C. up to April 2010. Thirty six(36) factors, attributable to cost overrun and time delay mentioned above, are used as a

preliminary list of factors which presented in the questioner to be rated by the respondent project officers using Likert scale as adapted from (Rahman et al., 2012).

1.7 Limitation Of The Study

This research included the following limitations:

1. The study did not included the perspective of consultant and contractor on identifying causes of cost overrun and time delay on the SDG program office projects.
2. The study did not included the perspective of consultant and contractor on cost and time delay causing factors managing techniques on the SDG program office projects.
3. The study did not included the impact of cost overrun and time delay of SDG projects.
4. The duration of research from July 2008 E.C. to April 2010 E.C. Ethiopian budget year only.

1.8 Organization Of The Study

This study format follows the logical steps of establishing the research questions, developing the methodology, gathering and analyzing data, and drawing conclusions. The study is organized into six chapters as follows:

Chapter 1 discusses the introduction of the research by highlighting the research problems, research purpose, research objectives, proposed methodology and research organization. The second Chapter Presents a literature review in-depth understanding of definitions. It examines literatures, studies and journals about delay causes in the development projects. Effects of project delays on project delivery performance and prime measures of success i.e. time, cost and quality.

Chapter three describes the data collection method, analysis techniques and statistics used to identify causes of delay and cost overrun on SDG projects in Afar region. And chapter four

presents the findings and discussion based on the results obtained from questionnaire responses. Finally Chapter five is the conclusion and recommendation chapter and discusses the research conclusions, limitations of the research, and provides recommendations based on the findings.

CHAPTER TWO : LITERATURE REVIEW

2.1 Introduction

Time and cost overruns occur in most development construction projects and the magnitude varies considerably from project to project. So it is essential to define the actual causes of time and cost overruns in order to minimize and avoid the delays and increasing cost in any construction project. This chapter review literatures concerning the major issues of time and cost overruns in order to recognize the factors that affect cost and time overrun in construction.

2.2 Causes Of Cost overrun and time delay

2.2.1 Theoretical review

A project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates that a project has a definite beginning and end (PMBOK, 2013). A project can be considered to be any series of activities and tasks that have funding limits(if applicable) (Kerzner, 2009).

Projects are often utilized as a means of directly or indirectly achieving objectives within an organization's strategic plan. Like Social need (e.g., a nongovernmental organization in a developing country authorizing a project to provide potable water systems, latrines, and sanitation education to communities suffering from high rates of infectious diseases) (Mukuka et al., 2014)

Time and cost performance is the fundamental criteria for success of any project. And the major contributors of this poor performance include design and documentation issues, financial resource management and project management and contract administration issues.(Memon,2012) Project success can be defined by achieving successful technical performance, staying on planned schedule and cost and not exceeding the initial budget or the anticipated time. In lots of construction projects across the world especially in the developing countries, most of the projects

participants cannot reach their goal as finishing the project on time and without additional cost. (Matin, 2016)

According to different literatures, it is clear that a variety of causes for time overruns exist in public construction projects. And according to Sweis, (2013) it is vitally important to note that major factors causing time overruns differ greatly among countries. Each country possesses its own divine characteristics and its own construction projects environment which indicates that the impact of time delay differ greatly between countries and it still hold opposing views regarding factors affecting time overruns.

Cost overruns are very common in the construction industry. Hardly few projects get completed within original costs (Subramani, 2014). In the case of Ethiopia, there is no different scenario as the literature shows. For example Nega (2008) explained that most construction projects in this country (Ethiopia) suffer from time and cost overrun.

In Ethiopia, the present state of the construction industry falls short of meeting domestic and international quality standards and the performance demand expected from the sector. (Ministry of Work and Urban Development, 2006)

Hence Cost overrun and time delays can occur for a wide variety of reasons on various types of projects which has led to the debate on how to minimize these projects cost overrun and time delays (Alinaitwe et al., 2013). However, Memon, Rahman, Asmi, and Azis (2010) state that in order to find measures of minimizing these overruns, the very first and most important step is to identify and understand the factors responsible for the overruns.

As in the case of sustainable development goals program office, it is not different to face delay and cost overrun. Each projects of the program office are undertaken with different performance levels, mostly with a significant performance lag from originally intended budget

and scheduled targets. And most of these are effective with serious cost overrun and time delay and some projects do not even effective at all. This is because the budget is transferred to the projects that shows cost overrun. Since this different delay and cost overrun from the targeted project performance for each projects in the program is attributed by different causes. Consequently it demands studying the causes of cost overrun and time delay within the SDG program office context and give a means of controlling or minimizing the effects of cost overrun and time delay resulted by the causes identified.

Even if delay of project and cost overruns in sustainable development goals projects are the most important problems at project management activity, research and studies in this development activities is not conducted before. Despite the importance and the significance of the project in the country (Ethiopia), as it was portrayed in the countries GTP 2 agricultural sector plan, the parties of projects (owner/client, consultant, and contractor) don't give serious attention on the time and cost overruns as an importance agenda to deal with. This is mainly because of little understanding of the causes and respective solutions for the problem prevailed in program office projects.

Projects financed by other than the government capital budget are also susceptible to cost overrun and time delay. According to African development bank review on the effectiveness of the financial support on water related infrastructure shows that due to long time overruns, implementation performance of individual projects was inefficient for all the water supply and sanitation projects resulting in delaying expected project benefits and outcomes. There were delays in loan effectiveness caused by delays in fulfilling conditions for entry into force and first disbursement of the loan. There were also procurement and disbursement delays resulting from delays in response times at the level of the Government, executing agencies and the Bank.

Furthermore, there were delays caused by turnover of project implementation unit (PIU) personnel. Delays in completion of civil works resulted from poorly equipped contractors, poor equipment and lack of adequate working capital (particularly for those engaged in water supply projects). Exogenous factors such as non-availability of local construction materials and security problems of the time and delayed supply of goods from suppliers had also contributed to the overall implementation delays. The implementation performance of the projects is rated unsatisfactory (African Development Bank, 2006)

According to construction project management handbook, the project's highest levels of activity, in terms of numbers of personnel and costs incurred per day, occur during construction. The construction phase also has the most opportunities for cost overruns due to changes and delays, disputes with contractors, and the resulting contract changes and claims. Commissioning and mistakes caused by a lack of due care or professional negligence is also a process that may be a cause for the risk of delays and cost overrun (U.S. Department of Transportation, 2009)

Fluctuation of prices of material, cash flow and financial difficulties faced by the contractor, poor site management and supervision, lack of experience and schedule delay are causes of cost overrun and time delays (Ministry of Work and Urban Development, 2006)

Project management techniques play an important role in having a complete organized project which covers managing the materials, people, machinery, budget and methods used. This study, investigates factors that cause overrun of time and cost in water related infrastructure construction projects specifically in sustainable development goals project conducted by ministry of agriculture and livestock resource implemented in Afar regional state, Ethiopia.

2.2.2 Definition Of Terms

Time overruns

Time overruns is defined as the extension of time beyond planned completion dates traceable to the contractors (Kaming et al 1997). Delays are incidents that impact a project's progress and postpone project activities, delay causing incidents may include weather delays, unavailability of resources, design delays, etc. In general, project delays occur as a result of project activities that have both external and internal cause and effect relationship (Vidalis et al 2002). Choudhry (2004) and Chan (2001), defined the time overruns as the difference between the actual completion time and the estimated completion time. It was measured in number of days. From above, time overruns is defined as the time increased to complete the project after planed date which caused by internal and external factors surrounded the project.

Cost overruns

Cost overrun is defined as excess of actual cost over budget. Cost overrun is also sometimes called "cost escalation," "cost increase," or "budget overrun." (Zhu et al 2004). Cost overrun is defined as the change in contract amount divided by the original contract award amount .This calculation can be converted to a percentage for ease of comparison (Jackson' 1990). Cost overrun = Final Contract Amount – Original Contract Amount, Choudhry (2004) defined the cost overruns as the difference between the original cost estimate of project and actual construction cost on completion of works of a commercial sector construction project.

The primary findings of Mukuka M.J, Aigbavboa C.O., and Thwala W.D. (2014) emanating from the study of different literature revealed that a number of important factors which cause projects cost overruns, such as fluctuation of prices of material, cash flow and financial difficulties faced by the contractor, poor site management and supervision, lack of

experience and schedule delay. The study further revealed that poor site management, delay in progress payments, poor communication and financial difficulties by the contractor are among the identified causes of construction projects time delays. And also it is revealed that extension of project, additional cost, budget short fall, adversarial relationship between participants of the project, delayed payments to contractors, poor quality workmanship and dissatisfaction by project owners and consequently by end users as the major effects of cost overruns.

2.2.3 Sustainable development goals program projects

Accordingly, to catalyze transformation of the agricultural sector from subsistence oriented, low output sector to a high performing sector well integrated into the national economy, identification of key systematic bottlenecks in various aspects of agricultural development is mandatory. As a result different holistic approaches to address these bottlenecks are going to be undertaken after an adequate study is conducted .

These includes :Identification and prioritizing transformational interventions as well as developing and aligning around implementation targets, milestone, resources and roles

A. A dedicated focus for effective implementation;

B. Coordinating interventions beyond the agricultural sector;

C. Developing real-time solutions for implementation problems as they arise;

D. An enhanced monitoring and reporting system.(Ministry of agriculture & livestock resource, 2016).

Among the above bottlenecks the SDG program office projects effective and efficient implementation problem is the overwhelming agenda to deal with. With this regard the project performance level , specifically project cost and schedule, should be investigated and identified problems must be addressed accordingly.

The evaluation of the first growth and transformation plan (GTP-1) performance on watershed development and voluntary settlement program in the region motivated both the pastoral communities and executive bodies to further strengthen the development process. The second generation growth and transformation plan (GTP-2) focus on increase access to potable water, promote irrigation from surface and ground water, strengthen pastoral extension services, implement integrated social services institution and infrastructure development, and strengthen implementation capacity which align with the sustainable development goals (SDG). Hence the following major activities will be implemented in the SDG program offices:

- design and implement animal and human potable water development projects
- Promote irrigation from surface and underground water by using feasible irrigation technology
- Build roads and bridges to get access to development corridor areas.
- Develop development centers economic and social institution on selected areas
- Build capacity to enhance the implementation of watershed development, road and infrastructure. (Ministry of agriculture & livestock resource, 2016)

To achieve what the GTP-2 plan for the year starting from 2015G.C. to 2020G.C., ministry of agriculture and livestock resource and Afar regional state formulated a water centered SDG (sustainable development goals) program. During the year 2015G.C. to 2018G.C. the program office conducted water supply projects, irrigation projects, and capacity building projects.(Ministry of finance & economic cooperation, 2018).

Project management institute (PMI) and KPMG (a global network of professional firms providing a consulting work on different issues) jointly conducted a study of cost overrun and time delay on infrastructure projects in India. To accomplish this study, initially they identified

the reference factors or causes with exhaustive review of most experienced project managers and project officers in infrastructure. (Project management institute (PMI)-KPMG, 2012, P.121).

Here a summary of key factors affecting time and cost overrun is provided below for ministry of agriculture and livestock resource SDG program office projects based on PMI(project management institute) and KPMG (a global network of professional firms providing a consulting work on different issues) study on causes of cost overrun and time delays across various infrastructural projects. This is because of the researcher believe that the cost and schedule causing factors identified by PMI-KPMG summarizes the factors identified during the literature review with respect to projects and articulated within the SDG program office context.

The causes of cost overrun and time delay are summarized after referring the secondary data found from project office archive and discussion with project office personnel's which managed the project in the duration that the study focuses. In this processes some time delay causing factors like lack of strong rehabilitation and resettlement policy mentioned by PMI-KPMG study is omitted for the reason that it is not a realistic factor for the program. And pre-commissioning teething problem and delay in commissioning approval also replaced with the factor by absence of testing and commissioning standards. Likewise with respect to cost overrun, acquisition of land on market price and lack of strong rehabilitation and resettlement policy is omitted for the reason that they are not a realistic cost overrun causing factor for the program. But Ineffective procurement planning is considered as a cost overrun causing factors.

As a result causes of time delay are summarized in two phases i.e. At pre execution phase land/site hand over, delay in regulatory approvals, relationship with other projects, non flexible country plan, delay in decision making, and ineffective procurement planning. Whereas at execution & closing phase Design/scope change, Inadequate skilled resource, Contractual

dispute, Industrial relations & laws, Geological surprise, Co-ordination issues with project team/vendors, Geographical challenges & cultural difference, Absence of detail regulatory commissioning approach, Ineffective program management, Ineffective project monitoring, Lack of awareness of modern technology, Unavailability/Delay of funds, (Project management institute (PMI)-KPMG, 2012, P.9,P.14) And for causes of cost overrun, they are also summarized in two phases i.e. pre execution phase and execution phase. For pre execution phase Scope creep, Inadequate DPR (detailed project report), original estimate and budgeting, High cost of environment safe guard, Poor selection of consultant, Non flexible country plan and Ineffective procurement planning are identified. Whereas for execution phase Material price escalations beyond projections, Escalation in labor costs/ineffective utilization, Design changes/iteration, Incremental financial costs /foreign exchange volatility, borrowing cost, etc), Location & connectivity of project site, Inadequate availability of skilled resources, Weak contract administration & claim management, Weak procurement planning, Contractual dispute due to poor framing of contractual management, and Wrong/poor selection of technological equipment are identified. (Project management institute(PMI)-KPMG, 2012, P.25,P.27)

2.3 Mitigation Means Of Cost overrun and time delay

An analysis is needed to identify the impact of delay on time and cost followed by taking the appropriate action to mitigate delay and minimize the cost required. It is important to improve the estimated activity duration according to the actual skill levels, unexpected events, efficiency of work time, and mistakes and misunderstandings. Mitigation efforts are necessary to minimize losses and this can be achieved by many procedures such as protection of uncompleted work, timely and reasonable re-procurement, and timely changing or cancellation of purchase orders. It is important to predict and identify the problems in the early stages of construction and

diagnose the cause to find and implement the most appropriate and economical solutions (Abdul-Rahman et al 2006).

It was indicated from the survey findings derived from different levels of management that the major causes of delay are due to financial problems followed by manpower shortage and changes in the project requirements. All parties involved in the project also agreed that delay occurs mostly during the construction phase. Therefore, in resolving those problems, the units of analysis suggested to increase the construction productivity, followed by increase the expertise and skill of human resources, and conducted site meetings more frequently. A strategic view of solving delay problems should consider the importance of the management aspects, the effects of knowledge and information flow between the organization levels, and the importance of top management contribution in solving the problems.

From the clients perspective Abdulhamid, (2018) suggest that

- ✓ Pay progress payments regularly to contractors so that delays can be avoided, and the contractor's ability to deliver the project on time and within quality improved;
- ✓ Minimize change orders throughout construction to avoid delays to the project;
- ✓ Review and approve the design documents within the agreed schedule; and
- ✓ Verify the resources and capabilities of the lowest bidding contractors before awarding the contract are main mitigation means to mitigate cost overrun and time delay.

2.3.1 Measures to Control Construction Cost

There are some measures which are found from the researchers' study to control the construction costs or to overcome the problems of cost overruns. The researchers have their own opinion on how to solve the problems (Kaliba et al., 2009). The measures are presented as below:

a) **Proper Project Costing and Financing**:- Kaliba et al. (2009) stated that delays of schedule may occur caused of delayed in payments due to complex financial processes in client organizations. Delay in payment would cause financial difficulties to contractors and subsequently delay the schedule to complete the activities on site. Interest could be charged on delayed payments hence inducing cost overruns in the project.

b) **Competent Personnel**:- Kaliba et al. (2009) mentioned that contractors, consultants, and clients should ensure that they have the right personnel with appropriate qualifications to manage their projects efficiently. It is better if construction manager have experience and qualifications in project or construction management.

c) **Appropriate Scope Definition**:- Nega (2008) agreed that only concern on the works required completing the project successfully. Guard against incomplete identification of scope is important to avoid frequent changes. Also, do not incorporate the works out of scope to avoid unnecessary works.

d) **Proper Cost Control**: - Ashworth (1994) mentioned that one of the client's requirements in respect of construction project is assessment of its expected cost. Proper cost control is important as it is the general trend towards greater cost-effectiveness and ensures construction costs not solely in the context of initial costs, but in terms of life-cycle costs or total cost appraisal.

e) **Risk Management during Project Execution**: - Peeters and Madauss (2008) found out some approach to avoid cost overruns. In any development project, there must be contain certain amount of risks. Therefore, a risk management function needed to be performed by project manager to determine and reduce the risks of the particular project. The aim of risk management is to minimize any risk that might result failure to meet the project requirements.

f) **Appropriate Contractual Framework**:- Peeters and Madauss (2008) has supported that once the objective of cost has been estimated, it is followed by choosing an appropriate contract model where there are techniques to make a relationship between the initial estimate and final price.

g) **Increase Supply of Materials**:- Frimpong et al(2003)found that there should prepare adequate allowance for any emergency case in order to cover increasing in material cost due to inflation.

h) **Realistic Cost Estimation**:- The initial cost estimates should be as accurate as possible. Accuracy of cost estimation allows clients to check and determine the required funds for executing the project are made available when required (Kaliba et al., 2009).

i) **Efficient Management**:- Gould (2002) stated that efficient management is important to produce a productive and cost efficient site. Scope may changes due to inadequate planning and feasibility studies. In order to control the project effectively, the project manager must follow up the schedule to avoid additional costs and ensure the building can be occupied on time as planned.

2.3.2 Measures To Control time delay

According to Nadzirah Roslan (2014) clear information and communication channel, Choose experienced subcontractors with good reputation, Select experienced and capable subcontractors, Avoid frequent design changes, Adopt effective and efficient material procurement systems, Hire competent labor ,Follow the schedule , Follow the schedule, Progress payment to contractors should be followed according to schedule would be a mitigation measures that should be taken for the factors of Poor site management and supervision, Inadequate planning and scheduling, Incompetent subcontractors, poor project management, schedule delay, mistakes during

construction, cash flow and financial difficulties faced by contractors, delay payment to supplier/subcontractor respectively.

the most popular time planning and control technique is Gantt Bar Chart, which was used by 35% of contractors and 33% consultants. This is closely followed by critical path method (CPM) used by 28% contractors and 34% consultants. The use of software support is wide spread. In the study, the three leading applications were Microsoft Project, Asta Power Project and Primavera (Yakubu and Ming, 2010).

Unlike time control techniques where two methods were found to be dominant, cost control techniques are more diverse. Several techniques, such as project cost-value reconciliation, overall profit and loss, profit and loss at valuation dates, unit costing and earned value analysis, have some degrees of usage. However, none can be regarded as the overwhelming choice. Similarly, the use of support software is also more varied (Yakubu and Ming, 2010).

Project cost overrun is minimized and mitigated when maximum attention is paid to well-developed technical skills in modern projects (Doloi, 2013: 267). Olawale & Sun (2010: 513) noted that a critical investigation into cost overrun mitigation measures would result in their categorization according to the broad function they perform

Flyvbjerg (2008: 6-7) suggested two main concepts for minimizing the cost overruns on construction projects, namely reference-class forecasting and increased public sector accountability through more involvement by the private parties.

Brunes & Lind (2014: 5) suggested three key areas on how cost overruns could be reduced in a project: decentralization of budgets, where cost overruns in one project in a region lead to less cost overruns in other projects in the specific region. It should be easy to see when and where

cost overruns occur, and who was primarily responsible. ensuring a systematic use of external reviewers at the different stages of a project.

Peeters & Madauss (2008: 81) recommend a five-step approach to mitigating the effects of cost overruns in a project: realistic cost estimation; considering the project's life-cycle cost; appropriate contractual framework; cost control and risk management during the project phase, and a communication-managed insurance approach. Memon *et al.* (2013: 1970) concluded that site-management factors are the important factors causing cost overrun. They thus suggest that improved site management and supervision of contractors could result in better control of cost overruns. In conclusion, the magnitude of the cost overrun was reduced after a mandatory quality assurance process was introduced in Norway (Magnussen & Olsson, 2006: 286).

According to (Ali Al-Keim,2017) on the study of Strategies to Reduce Cost Overruns and Schedule Delays in Construction Projects by exploring the strategies senior managers use to reduce cost overruns and schedule delays in construction projects implemented in Qatar, He presented in his study by introducing lessons to senior managers in the construction industry for reducing cost overruns and schedule delays in property development projects. The senior managers in construction have a significant role in improving project cost and time by following the following recommendations:

1. Communicate the benefits of the study findings to different levels of their organizations to comprehend the advantages.

2. Examine the benefits of PMBOK as it contains all processes and knowledge areas addressed by the participants. PMBOK includes more processes and knowledge areas not defined by the participants.

3. Establish a systematic approach to apply the strategies stated in the study findings by having standardized processes and procedures.

4. Set an internal auditing system to monitor the application by middle and junior managers to the processes and procedures.

5. Do an annual update to latest strategies used by senior managers of leading PM consultants, then start again from the first point addressed above.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Cost overrun and time delay in public projects are as a result of many causes. Each cost overrun and time delay causes have different rate of occurrences and impact or in cumulative considered as importance. Some causes may happen frequently but their impact on cost and schedule may be less important. Whereas some other causes may happen less frequently and their impact may be important. Therefore, it is necessary to identify cost overrun and time delay causes based on their importance level considering the simultaneous effect of both occurrences and their impact, in order to rank their overall importance on cost overrun and time delay. This helps to prioritize the causes and hence to determine the mitigation actions to be taken. In this chapter, the research design and methodology followed to achieve the ultimate goal of the research which is specified previously will be discussed. In addition data and information sources, research instruments, samples and method of analysis are presented.

3.2 Research Design

The research followed a case study strategy which utilizes a descriptive research methods. It is descriptive because it tried to describe the actual factors that cause cost overrun and time delay and their management areas in sustainable development goals projects implemented in Afar region of Ethiopia and also how to manage them.

Both qualitative and quantitative approaches are chosen for the research study. The study utilizing literature review; secondary data collection from program office (contract documents, letters, memos and so on) and a primary data collected using a structured questioner.

3.3 Population and Sample Size

Population is described as a group of elements or cases, whether individuals, objects, or events, that conform to specific criteria and to which we intend to generalize the result of the research (McMillan and Schumacher, 2001). For the present research, the target population comprises of thirteen (13) SDG program office project personnel directly involved in the projects and four (2) horizontal departments of ministry of agriculture and live stock resources project monitoring and evaluation personnel. Here eleven (11) SDG program project officers and two (2) horizontal department, totally thirteen(13) sample respondents are taken as a sample for this study.

3.4 Sampling Techniques/Procedures

According to Saunders (2009), purposeful or judgmental sampling often used when working with very small samples such as in case study research and when you wish to select cases that are particularly informative. So that the sample of this research project were selected using purposeful or judgmental sampling. Based on Norman (2012), members sampled are key informants on the topic under investigation because people who actively involving in SDG projects of ministry of agriculture and live stock resources were selected. Here purposive sampling is considered for the reason that there are few numbers of target population which have a detailed knowledge about the projects implemented during the duration of 2008 E.C. to 2010 E.C. Care was taken to select different respondents from the client groups. The questionnaires were given to potential respondents personally with all briefing about the study objective and the cost overrun and time delay causing factors definition.

3.5 Sources Of Data And Collection Methods

Both qualitative and quantitative data were collected. The qualitative data were obtained from a review of program office documents and the study used a self-administered paper-based structured survey questionnaire which were designed according to the aims of the research. The questionnaire were also used a five-point Likert scale to measure the variables (Rating questions) to collect quantitative data. Scales to measure each variable (causes of cost overrun and time delay) developed based on prior studies with some factors being modified to adapt to this study. This study was conducted by collecting data from both primary and secondary sources.

3.5.1 Data Collection Instruments

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. For each type of measurement, there is an appropriate method that can be applied and not others. In this research, ordinal scales were used in the questionnaire. Ordinal scale is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the agreement or degree of importance (1, 2, 3, 4, 5) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities. They are merely numerical labels. Here a structured questioner is also used to collect data based on Likert scale and the researcher has the following scale format:

Table 3.1; Scales that represent chances of occurrence

Chances of	**Extremely**	**Very**	**Moderately**	**Slightly**	**Not**
Scale	**5**	**4**	**3**	**2**	**1**

Since, the study was to identify the important key causes which demand a priority in project management of the program office under study and in similar institutions, the

respondents are requested to rate the factors not only in five(5) (1-not importance, 2-slightly importance, 3-moderately importance, 4-very importance, 5-extremely importance) level by their importance level in resulting cost and time overrun but also the questioner have an option to collect a qualitative data concerning any additional factors that didn't mentioned in the questioner and measures that should be taken in managing the factors in the program office context.

3.5.2 Questionnaire design

A questionnaire was developed to assess the perceptions of client personnel on the importance index of causes of cost overrun and time delay of sustainable development goals program office projects conducted in Afar region. The identified causes influencing cost and schedule of overruns in the program office projects are identified through literature review and program office documents and by conducting discussion with experienced professionals in development infrastructure projects.

From literature review it has been identified causes which affect cost overrun and time delays in development infrastructure projects in various countries around the world. In spite of the identified all causes of cost overrun and time delay through literature review the study refers a frame work of thirty seven (37) causes based on the study conducted in infrastructure projects by an international project management institute(PMI) which is conducted in similar scenario. But not only all of these factors are the cause of time and cost overrun but also there are additional causes that must be specifically included in ministry of agriculture and livestock resource SDG program office projects context. So the study has been summarize thirty six(36) causes that has an effect of cost overrun and time delay in the program office projects.

The final questionnaire contains twenty(20) causes influencing schedule, and sixteen(16) causes influencing cost. The respondents were asked to fill the questionnaire and they have assured that the information will be confidential and used only for research purpose.

3.5.3 Questionnaire content

The procedure used in analyzing the results was aimed at establishing the relative importance of the various factors responsible for cost overrun and time delay and their mitigation means. The questionnaire gave each respondent an opportunity to mark the level of important on each factor that cause cost overrun and time delay by giving the response in five likert scale..

The questionnaire included three parts. These first part is general personnel information, the second part requests respondents to rate causes influencing cost overrun and time delays and identify additional important causes that are not included in the questioner and finally means of managing the causes is requested in the third part. closed and open-ended questions and Likert Scale options were used so that the responding process was become easier. A draft questioner is discussed with an experienced person in the development projects who was asked to critically review the design and structure of the questionnaire in addition to the researcher academy advisor of the project work in the effort to ensure that the questionnaire will serve its purpose when distributed to the personnel in the program. (The questionnaire is included in annex 1).

3.6 Validity and Reliability

Creswell (2009) states that employing multiple data collection instruments help the researcher to combine strengthen and amend some of the inadequacies and for triangulation of the data. In this study the primary data obtained from questionnaire triangulated by SDG program office projects document analysis; the key points of the questionnaire also prepared as a word document and back to the respondents for approval so that the researcher didn't

misunderstand anything and finally discussed summary of the findings with key project officials. And the data collected from the respondents were also checked for its reliability using Cronbach's alpha coefficient analysis. To address Validity of the study instruments the questionnaire will be pilot tested with sample of three (3) project engineers about the cost overrun and time delay causing factors by encouraging participants to make useful suggestions concerning ambiguous question items for clarity and ease of understanding. After pilot testing, the suggestions and corrections from the participants will be incorporated into the final questionnaire and the participants for the pilot testing will be excluded from the final sample. The pilot test will help to avoid any confusions, interpretation issues that respondents may face and mostly it will be used to check if respondents are understood the question items as intended to stated so that to avoid any misinterpretation. The reliability of the data collected from the respondents are going to be checked using Cranbach's alpha analysis.

3.7 Data Analysis and presentation Method

Data analysis was carried out using the Statistical Package for Social Science (SPSS) version 16. Descriptive statistics such as frequency distribution will be used to assess the demographic profile of the respondents to make the analysis more meaningful, clear and easily interpretable. Descriptive statistics allow the researchers to present the data acquired in a structured, accurate and summarized manner. The data collected from the field will be sorted for completeness, checked for any errors and omissions, and was summarized in tables. Also the data obtained from the study will be entered into the computer and was statistically analyzed include descriptive statistics and cross tabulation.

The method used in analyzing the results of the quantitative questionnaire forms is the Relative importance Index. This method is used to show the importance of each factor that cause

cost overrun and time delay in the program office by weighting them with the means of summing up the scores that each person gave to the issues.

Relative important index of i^{th} factor = RII

Equation 3.1 **RII = $\sum$ [(W_i x X_i) /(H x N)]** as adopted by Memon et.al, (2012)

Where W_i = weighting given to each factor by respondents and it ranges from 1 to 5

X_i = frequency of i^{th} response given for each cause

H = Highest rank = 5

N = The total number of respondents

3.8 Ethical Considerations

In order to keep the confidentiality of the data given by respondents, the respondents did not required to write their name and assured that their responses were treated in strict confidentiality. The purposes of the study were disclosed in the introductory part of the questionnaire. Furthermore, the researcher has tried to avoid misleading or deceptive statements in the questionnaire. Lastly, the questionnaires were distributed only to voluntary participants.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This part of the research deals with the analysis and discussion of the secondary and primary data gathered from the desk study of the program office documents and respondents response through questionnaire survey. After collecting qualitative and quantitative data through questionnaire and desk study, checking of the reliability of collected data through questionnaire, the importance level of cost overrun and time delay causes, the identification main causes of cost overrun and time delay, and the means of managing cost overrun and time delay causing factors on the SDG program projects are analyzed and discussed.

From the desk study of a variety of completed water related development construction projects implemented by the SDG program office but specifically five(5) projects were surveyed in detailed which consumes more than seventy percent (>70%) of the budget made available by MOFEC to the program. During the desk study all the documents of each project such as correspondence letters, project report, payment certificate, the contract amount, contract time during signing of the contract actual cost and actual completion time at completion of the project were thoroughly investigated. These help to understand the reasons behind each project for cost overrun and time delay, and to investigate how the actual cost at completion deviates from the contract amount.

4.2 SDG Projects performance

The following table shows the budget allocation to the project types implemented during 2008,2009 and 2010 Ethiopian calendar budget years.

Table 4.1:(Source: SDG program office Archive)

PROJECT TYPE or CATAGORY	**2008**		**2009**		**2010**	
	# Of Project	**Budget Allocated (mil. Br.)**	**# Of Project**	**Budget Allocated (mil. Br.)**	**No Of Project**	**Budget Allocated (mil. Br.)**
Irrigation	**7**	**100.10**	**3**	**91.64779**	**4**	**56.688299**
study, design and supervision	4	12.10	2	5.22372	3	5.11186
Construction	3	88.00	1	86.42407	1	51.576439
Water Supply & range land development	**12**	**109.896766**	**14**	**228.69509**	**9**	**135.40557**
study, design and supervision	6	8.071766	7	19.582	5	11.656265
Construction	6	101.825	7	209.11309	4	124.62251
Deep well drilling	**6**	**31.00**	**5**	**33.03528**	**1**	**8.7677966**
study, design and supervision	3	3.00	3	6.16059	0	0
Construction	3	28.00	2	26.87469	1	8.7677966
Roads	**2**	**32.016766**	0	0	0	0
study, design and supervision	1	2.016766	0	0	0	0
Construction	1	30.00	0	0	0	0
Capacity Building	**4**	**32.00**	**5**	**10.96647**	**1**	**0.5**
TOTAL	**31**	**305.013532**	**27**	**374.4**	**15**	**211.400**

Even if the above table shows the Afar regional government and federal institution (ministry of finance & economic cooperation and ministry of agriculture & livestock resource)

agreed and approved planned number of projects and budget for the respective years, the accomplished number of projects in each respective budget year are smaller and shown below.

Table 4.2:(Source: SDG program office)

Project Type	**2008(In mill. Br.)**		**2009(In mill. Br.)**		**2010(In mill. Br.)**	
	# Of Project	**Budget Expended**	**No Of Project**	**Budget Expended**	**No Of Project**	**Budget Expended**
Irrigation	**1**	**46.57302**	**2**	**102.24265**	**2**	**36.433200**
study, design and supervision	0	0	1	8.44744	1	35.025293
Construction	1	46.57302	1	93.79521	1	1.4079067
Water Supply & range land development	**10**	**224.1805**	**13**	**238.05563**	**6**	**54.554275**
study, design and supervision	5	13.14764	7	17.88967	3	4.7541913
Construction	5	211.0329	6	220.15596	3	49.8
Deep well drilling	**1**	**8.456912**	**2**	**28.151088**	**1**	**8.767797**
study, design and supervision	0	0	1	3.862114	0	0
Construction	1	8.456912	1	24.288974	1	8.767797
Roads	**0**	**0**	**0**	**0**	**0**	**0**
Capacity Building	**2**	**66.66195**	**3**	**4.6512776**	**1**	**0.2447283**
Total(SDG Projects Only)	**14**	**280.1444**	**20**	**373.10064**	**10**	**100.00**
Expenditure For previously Started Projects	**8**	**28.52759**	**1**	**1.2993588**	**0**	**0**
TOTAL		**374.400**		**374.400**		**100.00**

Comparing Table 4.1 and Table 4.2 , we can see that the initial base line scope agreed and approved by the government institutions is not implemented. This lower number of projects conducted in respective years with respect to the approved project scope is mainly because of the

budget deficit experienced by the program. This is due to the projects respective engineering estimate of cost and schedule after detail project analysis and design is far more than the budget and time allocated in base line scope.

The cost overrun and time delay is also continued during the execution phase of each projects. This effect is shown with the following table for the five(5) major projects conduced during the time that the research is dealing.

Table 4.3:(Source: SDG program office contract document: summarized)

No	Project Name	Project Initial Cost(Br)	Final Project Cost	Initial Estimated Schedule	Final Project Schedule	Remark
1	**Gewane water supply project**					
	Supervision	12,099,207.02	12,099,207.02	12 months	15 months	
	Construction	275,325,996.30	295,277,950.33			
2	**Ayishet water supply project**					
	Supervision	4,133,695.16	4,133,695.16	7 months	10 months	
	Construction	65,297,853.97	69,310,196.91			
3	**Ponds & Micro Dams project**					
	Supervision	3,802,714.01	3,802,714.01	3 months	6 months	
	Construction	33,842,600.73	31,161,237.92*			
4	**Ayishet Irrigation project****					
	Supervision	8,450,299.95	10,559,299.95	8 months	15 month	
	Construction	132,997,084.57	155,526,199.69			
5	**Sunuta, Badole, Hidadebel & Teru water supply project**					
	Supervision	1,064,796.51	1,064,796.51	3 months	10 months	
	Construction	40,348,404.93	28,621,578.09***			
TOTAL		**29,550,712.65**	**31,659,712.65**			
		507,463,535.57	**579,897,162.94**			

***Approximately 90% of the original activities are accomplished & the project is closed**

****The project is finalized but not made functional**

*****The project is not finalized yet and contract work proportional to the remaining contract value remained.**

Based on the result found in desk study; name of selected water related projects and their respective cost overrun and time delay extent are described as shown below in Table 4.4.

Table 4.4:(Source: SDG program office contract document: summarized)

No	Project Name	Cost Difference (Br)	Cost Difference (%)	Time delay (Months)	Time delay (%)
1	**Gewane water supply**	19,951,954.03	**7.247**	3	**25**
2	**Ayishet water supply**	4,012,342.94	**6.145**	3	**42.86**
3	**Ponds & Micro Dams**	702,897.26	**2.08**	3	**50**
4	**Ayishet Irrigation**	24,638,115.12	**17.42**	7	**87.5**
5	**Sunuta, Badole, Hidadebel & Teru water supply**	11,726,826.84	**29.06**	7	**233**
Total		**61,032,136.19**	**12.027**		

Before identifying the causes of time and cost overrun it has to be identified weather time delay and cost overrun exist or not. During desk study five water related projects conducted by the program office which consumes about 72.05% of the total budget allocated in the time frame which the research concentrates are selected and evaluated their estimated completion time and actual completion date then calculated the rate of time delay if any. This is also done for cost overrun in the same approach. The data was collected via reviewing project documents. On the basis of data gathered from the desk study, the entire project evaluated in desk study registered time delay and cost overrun. The rate of time delay ranges from a minimum of 25% to the

maximum of 233% of the contract time. And cost overrun ranges from a minimum of 2.08% to the maximum of 29.06% of the contract amount for individual projects.

Table 4.3 also shows that construction work (contractor works) is more susceptible to cost overrun than study, design and supervision (consultant work) works of projects in the program. But both contractor and consultant mutually affect the project performance with respect to cost and time delay. Generally, projects in the program are challenged by the cost overrun and time delay for different reasons or causing factors

4.3 Demographic Characteristics of respondents

The following table 4.5 shows the task assignment of respondents involving in project endeavor. Here the number of samples are thirteen(13).

Table 4.5 Respondents Category

RESPONDENTS DESIGNATION IN THE COMPANY		
DESIGNATION	**NUMBER**	**%AGE**
Project Coordinator	**1**	**7.69**
Project Team Leader	**4**	**30.77**
Project Officer	**6**	**46.16**
Horizontal Department Officers	**2**	**15.38**

The designation of the respondents shows a relatively wider variety of professionals which are relevant to the construction delay analysis. The respondents have been assigned as senior project coordinator, project team leaders, irrigation engineers, hydraulic engineers, civil engineer, electromechanical engineer, hydro geologists, contract administrator, finance specialist, contract administrators, and construction supervisors.

Table 4.6 below shows respondents' general and specific work experience, sex and academic status during the program office projects implementation time.

Table 4.6 Respondents Experience

WORK EXPERIENCE			SEX		ACADEMIC STATUS	
4-8 years	8-12 years	> 12 years	Male	Female	BSc.	MSc/MA
2	3	8	10	3	10	3

4.3 Causes of cost overrun and time delay in SDG Projects

4.3.1 Reliability of the Questionnaire

The reliability of the questionnaire was analyzed to find out whether it was capable of yielding similar scores if respondents used it twice. Cronbach's alpha was used to measure the reliability of the questionnaire. Cronbach's alpha is usually computed from the following formula:

Equation 4.1 Cronbach's alpha equation

$$\propto = \frac{k}{k-1}\left(1 - \frac{1}{{S_T}^2} \sum_{i=1}^{k} {S_i}^2\right)$$

where k = the number of items, S_i^2 = the variance associated with item i,S_T^2 the variance associated with the total (or sum) of all k item scores. SPSS 16.0 was used to compute alpha for all two sets of 18 & 16 causes for schedule and cost overrun items in the questionnaire respectively. The entire set of 34 items in the questionnaire was also analyzed. A summary of the tests is found in Table 4.7.

The reliability analysis of the questionnaire was tested so as to find out whether it was capable of yielding similar score if the respondent used it twice. A summary of the tests is given in Table 1 below.

Table 4.7: Results of Reliability Analysis

Variables	**Alpha**
Importance of factors causing cost overrun	**0.824084**
Importance of factors causing time delay	**0.809473**

According to Reynold & Santos(1999), alpha more than 0.7 implies the instrument is acceptable. Therefore according to the above results, the instrument was found to be reliable.

4.4.2 Summary Of The Questionnaire

The following table 4.8 and table 4.9 depicts the relative importance index of five major time delay causing factors and five major cost overrun causing factors respectively.

Table 4.8: Results of Relative importance Index (for time delay)

No	**SCHEDULE OVERRUN CAUSING FACTORS**	**RII - RELATIVE IMPORTANCE INDEX**
1	Design change	**0.88**
2	scope change	**0.86**
3	Ineffective project monitoring	**0.85**
4	Ineffective program management	**0.82**
5	Delay in decision making	**0.77**

The following table also shows the cost overrun causes with their importance level determined using a relative importance index analysis.

Table 4.9: Results of Relative importance Index (for cost overrun)

No	COST OVERRUN CAUSING FACTORS	RII - RELATIVE IMPORTANCE INDEX
1	Original estimate and budgeting	**0.91**
2	Design changes/iteration	**0.88**
3	Inadequate availability of skilled resources	**0.72**
4	Location & connectivity of project site	**0.69**
5	Weak contract administration & claim management	**0.68**

According to the results shown above, there are major factors that cause cost overrun and time delay in the SDG program office projects. As depicted in the above Table 4.8, it indicated that most respondents agreed that design change, scope change, ineffective project monitoring, ineffective program management and delay in decision making were the major factors which causes time delay in which relative importance index are founded 0.88, 0.86, 0.85, 0.82 and 0.77 respectively. In addition to time delay as depicted in table 4.9, most respondents has agreed that inadequate original estimate and budgeting, design changes/iteration, inadequate availability of skilled resources, location and connectivity of project site and weak contract administration & claim management were the major factors which cause cost overrun and their relative importance index score is 0.91, 0.88, 0.72, 0.69 and 0.68.

CHAPTER FIVE: CONCLUSION AND RECOMENDATION

5.1 Introduction

This chapter includes the conclusions and recommendations that would help in solving the problem of delay and cost overruns at SDG program projects in Afar regional state, Ethiopia. The first objective of this study objective was to identify factors influencing time and cost overruns in SDG program water related projects in Afar regional state. The second objective and the last one was to formulate recommendations to avoid or minimize time and cost overrun.

Desk study was used to identify the existence and extent of time and cost overrun on the water related projects of the SDG program projects in Afar region. Questionnaire survey was also used to identify which causes are the dominant factors of time and cost overrun with respect to the client/owner perspective. And this questionnaire is distributed with face to face communication and explaining the unclear questions raised by the respondents. The data gathered from the survey are analyzed using the relative importance index(RII).

5.2 Conclusion

Based on the results of the analysis of desk study and respondents' responses the following conclusions are drawn:

1. Since project's technical design and budget estimate was poorly conducted at project scoping and detail design stage, the project implementing cost exceeded much higher than the expected one. And the number of projects implemented is become lesser than the number of project planned at the start of each budget year.
2. Cost overrun is also prevalent because of unavailability of skilled resources to manage the projects in all projects phase. During scoping and design phase, projects which do not consider the ground situation are planned to be executed. And during execution phase,

inexperienced project officers lead projects as a consultant and contractors. The decision given in the project execution then become unprofessional and leads to extra budget allocation to correct it.

3. In addition to the above factors poor communication or inaccessibility of the project site with rest of the world brought higher cost than the engineering estimate.
4. Even if the above factors handled smoothly, poor contract administration & claim management brought cost overrun on the program office projects in sustainable development goals program projects.
5. After the projects scope is defined and detail design of projects finalized, contract agreement is signed between the client and the contractor. But the level of the projects design and scope definition quality was not satisfactory and extra time is consumed not only for correcting the scope and design of the projects but also for implementing the corrected scope and design aligning with the previously started projects activities. For this main reason design and scope changes are the main two time delay causing factors.
6. During project implementation, well organized project monitoring work is not conducted. According to many respondents, since projects are implemented with governmental consulting and construction institution, contractual obligations is not put on ground and the risks are dealt after the inconvenience is happened. And with this conditions extra time is consumed to correct the inconvenience in reactive way.
7. Different projects in the program should be conducted in coordinated way to achieve specific goal. But in SDG program some projects are managed in haphazard way that one projects waits another project to be finalized to become successful in achieving some of the program goals. And with this situation time delay is prevalent.

8. The program office is full of delay in evaluating the program office projects and decide issues seen in the projects endeavor. Hence as a result, time delay become common in the program office projects.

Finally, From the results obtained at this paper, and compare it with the results and analysis of previous literatures, it's found that there are only few similarities of the important factors that influencing time delay and cost overruns. The above comparison confirms our previous assumption that trigger the researcher to study SDG program projects specifically. These assumption is different projects have different causes of factors depending on the social, economical and political difference coming from the projects place and time.

5.3 Project Work Study Recommendation

All respondents come with fifty two(52) measures which should be taken to minimize the effects of cost overrun and time delay. Since the measures have similarities and the researcher categorized them in to six(6) areas summarized below.

1. Project Scoping & Planning

Projects pre-execution phases of scoping and detail design should be reviewed and with all stake holders to have the ownership environment, to have different dimensions that should be included in the project endeavors, to make awareness about the project, to increase the stake holder engagement, to mobilize the community(beneficiaries). The project's cost benefit analysis should be given a serious concern.

2. Project Monitoring & Control

Implementing an effective project monitoring & control activities specifically imposing contractual obligation which may demand to benefit or penalized consultants and contractors for the efficient or inefficient performances they have shall be a norm of the program office projects.

Take a proper and standardized lesson learned experience collecting frame work from past activities and previous projects which will help to make all challenges and opportunities clear to all personnel and higher officials and give a fast response for the question raised in project endeavors.

3. Program Management

Projects in a SDG program office shall be undertaken in a such way that finalizing one projects should be the benefit of the next one instead of waiting other projects to be finalized in achieving their target. For example power supply projects from the national grid or from other economical independent energy sources must be realized before finalizing projects specially irrigation projects. And also access road must be considered prior to the projects commencement.

4. Capacity Building & Leadership

The client, consultant and contractor personnel should have a training on project management and the program office should consider some kind of motivational schemes including an appropriate and well organized site camp facilities, arranging some social events which the workers express themselves other than project work life, awarding project stuffs for their well achievement properly, implementing appropriate project leadership style. On the other side projects should employ personnel's with an appropriate competency which understands the appropriate systems and technologies that fit the projects.

5. Project Communication

The SDG program office must work hard to bring an formal, easy and flexible communication channels which links within the program office and between the program office and the other departments of the ministry of agriculture and livestock resource, consultants and contractors.

These channels allows a vertical and horizontal information flows to facilitate an effective project management. For example every challenges and opportunities identified through proper project monitoring and evaluation can be clear to all personnel and higher officials.

6. Risk Management

The project stake holders must have common risk management plan to minimize any factors to bring a schedule and cost overrun. Specially imported items like different types and sizes of pipes and electro mechanical equipments must be considered prior to the project face schedule and cost constraints.

The themes found in the study support these six area of recommendations. The study findings might be helpful for senior managers and employees.

5.4 Suggestions For Future Work

The researcher suggests further study on the following issues to benefit future SDG program projects and other similar water related projects implemented in Afar region.

1. The impact of cost overrun and time delay of SDG water related projects in Afar region, Ethiopia.
2. The perspective of consultant and contractor on causes of cost overrun and time delay and their managing techniques on SDG water related projects in Afar region, Ethiopia.

REFERENCE

African Development Bank. (2006). Ethiopia: Review Of Bank Group Assistance To Public Utility Sector

Alinaitwe, H., Apolot, R. and Tindiwensi, D. (2013). Investigation Into The Causes Of Delays And Cost Overruns In Uganda's Public Sector Construction Projects: Journal of Construction in Developing Countries, 18(2), 33–47, 2013.

Choudhury I. and Phatak O., (2004). Correlates of Time Overrun in Commercial Construction, ASC proceeding of 4th Annual Conference, Brigham Young

Chan A. P.C., (2001). Time Cost Relationship of Public Sector Projects in Malaysia. International Journal of Project Management, Vol. 19, No.4, pp. 223-229

Danial Mirzai, Matin. (2016). Identifying The Effective Factors For Cost Overrun & Time Delay In Water Construction Projects.

Federal Transit Administration, Office of Research, Demonstration and Innovation, U.S. Department of Transportation. (2009). Construction Project Management Hand Book.

Fetene Nega. (2008), Causes & Effects Of Cost Overrun On Public Building Construction Projects In Ethiopia

I A Rahman, A.H. Memon,S.Nagapan,Q.B.A.I. Latif & A.A.A. Azis.(2012). Time & Cost Performance Of Construction Projects In Southern And Central Regions Of Peninsular Malaysia.

Jomah Mohammed Al-Najjar.(2008). Factors Influencing Time & Cost Overrun On Construction Projects In Gaza Strip.

Kaming, P.F.; Olomolaiye, P.O.; Holt, G.D and Harris, F.C. (1997). Factors Influencing Construction Time And Cost Overruns On High-Rise Projects In Indonesia. Construction Management and Economics, Vol. 15, 83-94.

Kerzner Harold.(2009), Project management : A Systems Approach To Planning, Scheduling, And Controlling, International Institute For Learning, New York (USA)

Mark saunders, Philip lewis, Adrian Thornhill, (2007). Research Methods For Business Students, Pearson Education Limited, England.

McMillan, J. H., & Schumacher, S. (2001). Research In Education. A Conceptual Introduction (5th ed.). New York: Longman.

Memon, A.H., Rahman, I.A., Asmi, A. and Azis, A., (2010). Factors Affecting Construction cost in Mara Large Construction Project: Perspective of Project Management Consultant: International Journal of Sustainable Construction Engineering & Technology: Vol1, No2.

Ministry Of Agriculture And Livestock Resource (MOA&LR) (2008,2009 & 2010). SDG projects plan.

Ministry of agriculture & livestock resource (MO&NR).(2016). Sector Growth and Transformation Plan 2.

Ministry of finance & economic cooperation(MOF&EC),(2018). SDG program finance management directive.

Ministry of Work and Urban Development (MOWUD).(2006).Urban development policy.

Mukuka M.J, Aigbavboa C.O., and Thwala W.D. (2014). Theoretical review of the causes & effects of construction projects cost overrun & time delay.

Pramen P. Shrestha, Leslie A. Burns, and David R. Shields(2013). Magnitude Of Construction Cost And Schedule Overruns In Public Work Projects

Project Management Institute(2013). A Guide To The Project Management Body Of Knowledge Library of Congress, USA.

fawszProject Management Institute-KPMG(2012).Study on project schedule and cost overruns: Expedite infrastructure projects.

Raj Kapur Shah (2016). an exploration of causes for delay & cost overrun in construction projects: A case study of Australia, Malaysia,& Ghana

T Abdul Rahman(2013).Significant factors causing cost overrun in large projects in Malaysia.

T.Subramani, P S Sruthi, M.Kavitha.(2014).Causes of cost overrun in construction.

Vidalis, M.S and Najafi, T.F., (2002). Cost and Time Overruns in Highway Construction, 4th transportation specially conference of the Canadian Society for Civil Engineering, Montreal, Quebec, Canada June 5-8 (2002).World Bank Report,

Zhu. K. and Lin.L., (2004). A Stage By Stage Factor Control Frame Work for Cost estimation of Construction Projects, Owners Driving Innovation International Conference.

http:/ flybjerg. Plan.aau.dk / JAPAASPUBLISHED.pelf.

ANNEX 1: Questionnaire For Research Project Work

INTRODUCTION

This questionnaire is prepared to obtain information from key informants with structured questions. The information is required for the academic research entitled "Causes of Project Cost overrun and time delay: The case of ministry of agriculture & livestock resource Afar SDG (sustainable development goals) program projects", which is being conducted as partial fulfillment of MA in project management. The main objective of the research is to identify the main factors that lead to time and cost overruns, and make recommendations based on the findings.

The questionnaire consists of three sections. Section 'A' general respondent information. Section B contains causes of cost overrun and time delays. And section 'C' mitigation means for the causes in SDG projects implemented in Afar regional state, Ethiopia.

Your response, in this regard, is highly valuable and contributory to the outcome of the research. All feedback will be kept strictly confidential, and utilized for this academic research only.

Thank you,

FITSUM BULLO

Post graduate student, Project management

School Of Commerce, Addis Ababa University

Tel: 0911807325

Addis Ababa, Ethiopia

SECTION A: General Personnel Information

1. Name of organization: **Ministry of Agriculture and Livestock Resource**

2. Sex

☐ ☐

Female Male

3. State respondent involvement to the project.

☐ ☐ ☐ ☐

Project Officer Project Team Leader Project Coordinator Horizontal Department Personnel

Other _____

4. Respondents educational level:

☐ ☐ ☐ ☐

Diploma First degree Second degree Third degree

5. Relevant working experience (Years):

☐ ☐ ☐ ☐

1-4Yrs 4-8Yrs 8-12Yrs >12Yrs

SECTION B: Causes Of Time Overruns Of SDG Projects In Afar

Please indicate the importance of each causes by ticking the appropriate boxes.

E.I. = Extremely importance (5); **V.I.** = Very importance (4); **M.I.**= Moderately importance (3);

S.I. = Slightly importance (2); **N.I.** = Not importance (1)

No	Causes Of cost overrun and time delay	E.I	V.I	M.I	S.I	N.I
	Schedule Overrun in pre-execution phase					
i.	Land/site handover					
ii.	Delay in regulatory approvals					
iii.	Relationship with other projects (Forward and Backward linkages)					
iv.	Non-flexible country plan					
v.	Delay in decision making					
vi.	Ineffective procurement planning					
	time delay in the execution phase					
vii.	Design change					
viii.	Scope change					
ix.	Inadequate skilled resource					
x.	Contractual dispute					
xi.	Industrial relations & laws					
xii.	Geological surprise					
xiii.	Co-ordination issues with project team/vendors					
xiv.	Geographical challenges					
xv.	Cultural difference					
xvi.	Absence of detail regulatory commissioning approach					
xvii.	Ineffective program management					
xviii.	Ineffective project monitoring					
xix.	Lack of awareness of modern technology					
xx.	Unavailability/Delay of funds					

No	Causes Of cost overrun and time delay	E.I	V.I	M.I	S.I	N.I
	Cost Overrun (pre-execution phase)					
xxi.	Scope creep					
xxii.	Original estimate and budgeting					
xxiii.	High cost of environment safe guard					
xxiv.	Poor selection of consultant					
xxv.	Non flexible country plan					
xxvi.	Ineffective procurement planning					
	Cost Overrun (execution phase)					
xxvii.	Material price escalations beyond projections					
xxviii.	Escalation in labor costs/ineffective utilization					
xxix.	Design changes/iteration					
xxx.	Incremental financial costs (foreign exchange volatility, borrowing cost, etc)					
xxxi.	Location & connectivity of project site					
xxxii.	Inadequate availability of skilled resources					
xxxiii.	Weak contract administration & claim management					
xxxiv.	Weak procurement planning					
xxxv.	Contractual dispute due to poor framing of contractual management					
xxxvi.	Wrong/poor selection of technological equipment					

If you have additional causes of cost overrun and time delay of SDG projects kindly requested to write here with respective importance level:

_____

_____

_____

_____

_____

_____.

SECTION C: Means Of Managing Causes Of Cost overrun and time delay.

If you have means of managing cost overrun and time delay specified above kindly request to write here:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____ .

Annex: 2

Results of Relative importance Index (for time delay)

No	TIME DELAY CAUSING FACTORS	RII - RELATIVE IMPORTANCE INDEX
1	Land/site handover	**0.42**
2	Delay in regulatory approvals	**0.51**
3	Relationship with other projects (Forward and Backward linkages)	**0.46**
4	Non-flexible country plan	**0.45**
5	Delay in decision making	**0.77**
6	Ineffective procurement planning	**0.68**
7	Design change	**0.88**
8	Scope change	**0.86**
9	Inadequate skilled resource	**0.72**
10	Contractual dispute	**0.52**
11	Industrial relations & laws	**0.43**
12	Geological surprise	**0.68**
13	Co-ordination issues with project team/vendors	**0.57**
14	Geographical challenges	**0.69**
15	Cultural difference	**0.58**
16	Absence of detail regulatory commissioning approach	**0.54**
17	Ineffective program management	**0.82**
18	Ineffective project monitoring	**0.85**
19	Lack of awareness of modern technology	**0.57**
20	Unavailability/Delay of funds	**0.65**

Annex:3

Results of Relative importance Index (for cost overrun)

No	COST OVERRUN CAUSING FACTORS	RII - RELATIVE IMPORTANCE INDEX
1	Scope creep	**0.63**
2	Original estimate and budgeting	**0.88**
3	High cost of environment safe guard	**0.48**
4	Poor selection of consultant	**0.62**
5	Non flexible country plan	**0.48**
6	Ineffective procurement planning	**0.66**
7	Material price escalations beyond projections	**0.63**
8	Escalation in labor costs/ineffective utilization	**0.62**
9	Design changes/iteration	**0.91**
10	Incremental financial costs (foreign exchange volatility, borrowing cost, etc)	**0.58**
11	Location & connectivity of project site	**0.69**
12	Inadequate availability of skilled resources	**0.72**
13	Weak contract administration & claim management	**0.68**
14	Weak procurement planning	**0.63**
15	Contractual dispute due to poor framing of contractual management	**0.51**
16	Wrong/poor selection of technological equipment	**0.54**