Risk Identification in the Controlling Process of Trans Sumatera Toll Road Project Based on PMBOK 6th Edition

Reisha Ananda Putri
Magister Program Student of Construction Management
Department of Civil Engineering
University of Indonesia
reisha.ananda@ui.ac.id

Yusuf Latief
Professor of Department of Civil Engineering
University of Indonesia
latief73@eng.ui.ac.id

Abstract

Encouraging the process of accelerating national strategic projects, several sections of Trans Sumatra Toll Road project use design and build contract method that combines several stages into a parallel process which is expected to shorten construction time. However, in practice, there is still a phenomenon of project delays which can lead to cost overruns and lost opportunities to work on other projects. Therefore, a good control process is needed as a function of construction management activities to minimize any deviations that can occur during the project. This study uses the Project Management Body of Knowledge (PMBOK) 6th Edition approach in determining the variables to find out the control process and also to identify the risks that occur in the controlling process of Trans Sumatra Toll Road project. A literature study was conducted to find control activities and list of risks in similar cases and then validated by experts who were directly involved in the process of controlling the Trans Sumatra Toll Road project. The results obtained are as many as 94 activities in the control process and as many as 81 lists of risk in the control process. The dominant risk factor was obtained using the Relative Important Index (RII) method. The top five risks to the frequency of occurrence are as follows: Land acquisition delays, Weather conditions such as high rainfall or extreme weather, Lack of control over the implementation schedule, Complicated licensing issues, and Inaccurate DED planning data resulting in frequent design reviews

Keywords
Control process, Trans Sumatra Toll Road, Design and build, Risk management, Time performance

1. Introduction

The Trans Sumatra toll road project has been declared as a Major Project in the 2020-2024 National Mid-Term Development Plan. As one of the efforts to accelerate development, Indonesia Ministry of Public Works and Public Housing (PUPR) encourages construction development in conjunction with land acquisition so that several Trans Sumatra toll roads used design and build contract system. Design and build is a method where the planning, preparation and design processes are carried out in parallel with the construction implementation with the hope that the project can be completed faster than conventional methods. However, research on the relevant recent literature shows that construction projects with design and build contracts do not escape major cost overruns, delayed schedules and quality-related problems. This can be caused by the project control process that is not running well. Planning and control are the most basic functions in realizing project success, namely the optimization of construction implementation on results with a correlation between cost, quality and time. (Gunadharma et al. 2019)

In the construction of the Trans Sumatra toll road project itself, precisely at the section of Simpang Indralaya - Prabumulih, there is a phenomenon of project delays from the time agreed in the initial contract. This toll road project has undergone 3 (three) changes or time addendum, which was originally targeted for completion in July 2021 and

was extended to May 2022. The plan and realization of project implementation progress can be seen in the following figure 1:

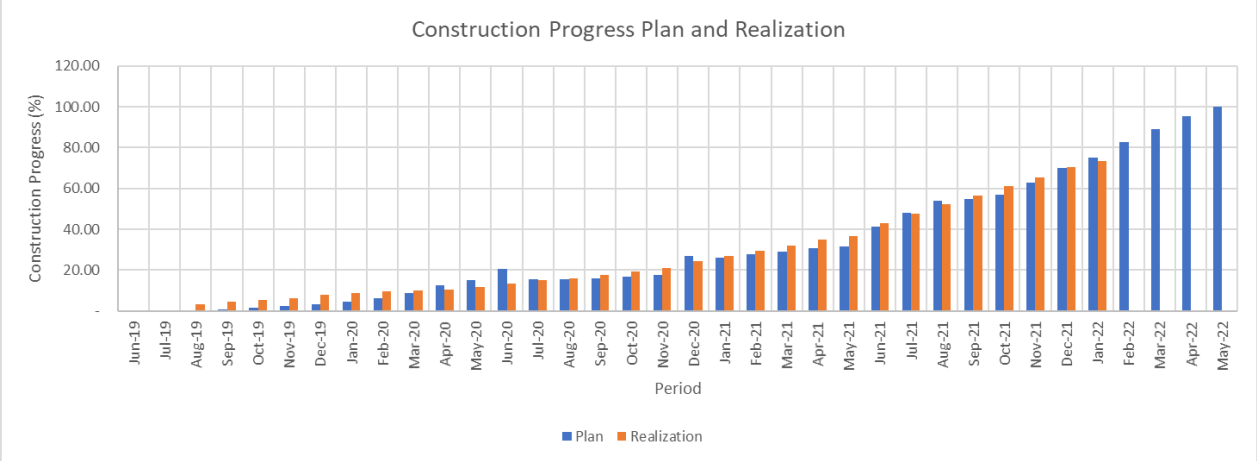

Figure 1. The Plan and Realization of the Construction Progress
Source: Hutama Karya, 2022

In construction, project delay can be defined as the missed deadline for project completion from the time specified in the contract, or from the time agreed by the parties involved in the completion of a project (Assaf & Al-Hejji, 2006). Delays in construction projects can cause losses, and have a negative impact on part or all of the project. Because of this phenomenon, it is necessary to implement a standardized project control system, which is based on PMBOK 6th Edition by considering the risks that occur in it.

1.1 Research Purposes

This research aims to identify the control process along with the activities carried out in the Trans Sumatra Toll Road project and to identify any risk factors that occur in each control process activity refer to PMBOK 6th Edition. To achieve the research purposes, the following steps were taken:

1. Select an existing framework to be adapted and used as a research basis.
2. Conduct a literature study to find out the control process along with the activities and risks faced in the implementation of similar construction work as information needs in compiling a questionnaire.
3. Validate the experts
4. Analyze to get the biggest risk factor

2. Literature Review

2.1 Trans Sumatera Toll Road with Design and Build Contract

In order to encourage regional development on the Sumatera Island and to support national economic growth, the Government has given a mandate to PT Hutama Karya (Persero) to build and develop the Trans Sumatra Toll Road. This toll road will connect many provinces in Sumatera from Lampung to Aceh through 24 (twenty-four) different toll road sections with a total length 2,765 km and it is planned to be fully operational in 2024. Indonesia Ministry of Public Works and Public Housing push for construction along with land acquisition so that several sections of the Trans Sumatra toll road using a design and build system. These sections include the Bakauheni – Terbanggi Besar section, Terbanggi Besar – Pematang Panggang section, Pematang Panggang – Kayu Agung section, Sigli – Banda Aceh section, Kuala Tanjung – Tebing Tinggi – Parapat section, Indralaya – Muara Enim section, Pekanbaru – Pangkalan section, Taba Penanjung – Bengkulu section and Binjai – Langsa section.

The object of review in this research taken in the construction of Trans Sumatra Toll Road section Simpang Indralaya – Prabumulih with 64.7 km track length which was built and construct using a design and build system as an effort to accelerate the completion of the project by running the process of land acquisition scope, design planning and construction implementation are constructed in an integrated and parallel (Figure 2).

Figure 2. Location Map of Indralaya – Prabumulih Toll Road Project
Source: Hutama Karya, 2019

2.2 Project Control Process of Trans Sumatera Toll Road

The success in the project development depends on that created by the four elements of the development builder, namely the Owner, Contractor, Planning Consultant and Supervising Consultant. The work arrangement of each element will create a unified functional unit and action to achieve the stated goals. In the implementation of a construction project, it could have caused deviations from the implementation of the plan, it is necessary to supervise and control the project to minimize and eliminate the risks of mismatches between planning and implementation that will hinder the project achievement.

The control process on Trans Sumatra toll road project consists of monitoring and controlling of cost (cost control), monitoring and controlling of project quality (quality control), monitoring and controlling of project time (time control) and monitoring and controlling of project reports.

2.3 Project Control Process Based on PMBOK 6th Edition

PMBOK explains that there are 5 (five) processes groups that must be passed in a series of project activities, namely Initiating (project initiation), Planning (project planning), Executing (project execution), Monitoring & Controlling (project control and monitoring) and Closing (project closure). In these five processes, PMBOK 6th Edition explains that there are at least 10 (ten) competencies is more often called Knowledge Areas. (Figure 3).

Knowledge Area	Project Management Process Group and Knowledge Area Mapping				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring & Controlling Process Group	Closing Process Group
4 Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Manaement Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or a Phase
5 Project Scope Management		5.1 Plan Scope and Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6 Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7 Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8 Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9 Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10 Project Communication Management		10 Plan Communication Management	10 Manage Communications	10 Monitor Communications	
11 Project Risk Management		11 Plan Risk Management 11 Identify Risks 11 Perform Qualitative Risk Analysis 11 Perform Quantitative Risk Analysis 12 Plan Risks Responses	12 Implementation Risk Responses	12 Monitor Risks	
12 Project Procurement Management		12 Plan Procurement Management	12 Conduct Procurements	12 Control Procurements	
13 Project Stakeholder Management	13 Identify Stakeholders	13 Plan Stakeholder Engagement	13 Manage Stakeholder Management	13 Monitor Stakeholder Engagement	

Figure 3. Project Management Process Group and Knowledge Area Mapping
Source: PMBOK 6th Edition, 2017

Monitoring and controlling process consists of the processes needed to identify, to analyze and to manage project progress which areas are changing as planned and making changes accordingly. According to PMBOK 6th Edition, there are 3 (three) main stages in the ITTO process (Input, Tools and Techniques, Output) of the process of monitoring and controlling project work (Figure 4).

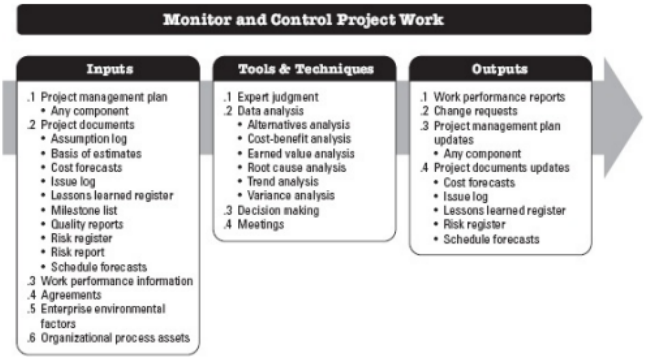

Figure 4. Input, Tools & Technique and Ouputs dari Monitor and Control Project Work
Source: PMBOK 6th Edition, 2017

2.4 Connection of Control Process Risk Factors with Time Performance

Every construction project is always faced by the possibility of various kinds of risks. Higher the profile of a project in terms of value, construction speed and the complexity of a project, greater the level of risks are covered by the construction project. These risks have a great effect in achieving the success of a construction project. However, there is no specific research to explain how to manage the risk originating from these risk factors, so it is important to produce a better control process for the success of a construction design project.

The purpose of controlling and supervising project time is a method of controlling and supervising the evaluation process of the construction implementation is related to control the time of work completion and *schedule* of project. The problems will appear if there is a discrepancy between the plan and the actual realization. The general impact that often occurs is project implementation delay, in addition to increasing project implementation costs. project implementation delays generally always cause adverse consequences for both the owner and contractor, because the impact of delays is conflict and debate about what and who is being the cause, in addition to demands. time and additional costs. Delays are part of the implementation time that cannot be utilized according to the plan, thus causing some of activities that follow to be delayed or cannot be completed according to the planned schedule. So it is necessary to identify the risk factors that can occur in every activity in the control process to minimize the mismatch of completion construction project plan. (Alam, 2011)

3. Methods

Research methodology is a scientific process that is commonly used in research or ways to gain data which will be taked for the purpose of the research. In methodology, it attempts to discover the questions given in systematic ways that are used and attempt to find out all the answers until it can draw conclusions. (Sugiyono, 2012)

Identify project control processes and identify risks that occur in each activity by implementing the PMBOK 6th edition by means of literature studies related to risks that cause project delays. The list of control activities and the list of established risks, then a questionnaire is made with the aim to obtain validation of these variables suitability to the experts who are directly related for the controlling process of the Trans Sumatra Toll project with a minimum working period of 10 years. Questionnaire survey among owners and consultants will be analyzed apply the Relative Importance Index (RII). (Santosa, 2020) (Figure 5).

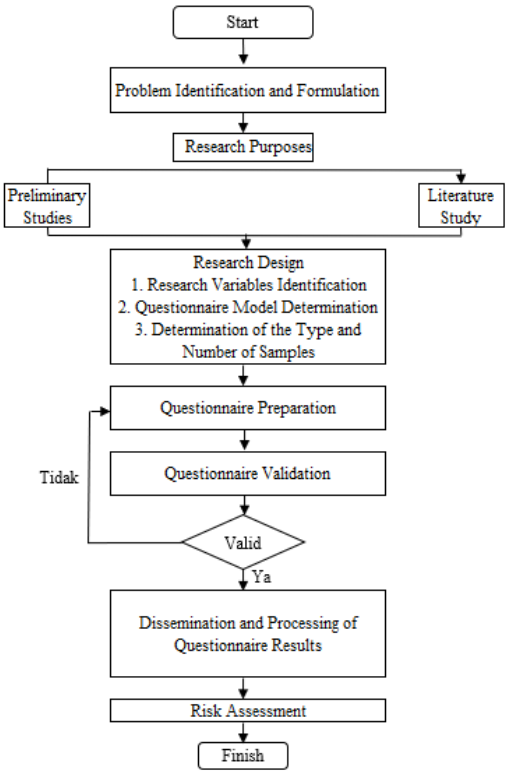

Figure 5. Research Flow Chart

4. Data Collection

Researchers have conducted a study of related literature through internal company documents, similar research journals, existing and appropriate reports and books to obtain control processes along with activities and early identification of risks. The control processes and activities are grouped based on the knowledge area in the monitoring and controlling process group in PMBOK 6th Edition, including: Project Integration Management, Project Scope Management, Project Schedule Management, Project Cost Management, Project Quality Management, Project Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management and Project Stakeholder Management. Based on the literature study that has been carried out, a total of 95 activity variables in the control process that may be carried out on the project are obtained. As for risk identification, in this study obtained risk factors that can occur in the process of controlling the Trans Sumatra Toll Road project. Furthermore, these 87 (eighty-seven) factors were grouped into eleven groups taken from the input process group as well as tools and techniques in the process of monitoring and control project work on PMBOK 6th Edition with the addition of one additional variable, namely "Perform Integrated Change Control". The risk factor groups are: Project Management Plan, Project Documents, Work Performance Information, Agreements, Enterprise Environmental Factors, Organizational Process Assets, Expert Judgment, Data Analysis, Decision Making, Meetings and Perform Integrated Change Control.

Content validation was carried out by five experts to evaluate the validity of the contents of the questionnaire, to check readability, to verify whether the activity variables and risk factors were in accordance with the conditions that occurred in the Trans Sumatra Toll Project, and experts were also allowed to provide opinions if needed. The selection of respondents was carried out on certain considerations based on their abilities and knowledge as well as work

experience which is believed to be able to provide answers to the questionnaire according to the research topic (Table 1).

Table 1. Respondent Profile

Respondent Code	Position in Project	Work Experience	Position	Education
P1	Owner	30 Years	Project Director	S2
P2	Owner	18 Years	Control and Operational Manager	S1
P3	Consultant	37 Years	Project Engineer	S1
P4	Consultant	22 Years	Quantity Engineer	S1
P5	Consultant	10 Years	Project Control	S1

5. Results and Discussion

From the 95 activity variables in the proposed control process, it was confirmed that 94 activities were carried out and there was 1 activity that has not been carried out on the project, namely "a show cause meeting (SCM)" to evaluate any indications of delay (Appendix I).

As for the identification of risk factors, from the 87 risk lists in the proposed control process, 81 confirmed risk lists were found in the Trans Sumatra Toll Road project (Appendix II)

The results of the RII analysis obtained the largest risk factors based on their impact or influence on the performance of the project implementation time and the largest risk factors based on the frequency of occurrence on the trans Sumatra toll road project which can be seen in the following table 4:

Table 4. Highest Risk Rating from RII Analysis

No.	RISK VARIABLE TO THE IMPACT			RISK VARIABLES TO FREQUENCY OF EVENT		
	Code	RII	Risk Variables	Code	RII	Risk Variables
1	X3.1	4.86	Delays in land acquisition	X3.1	4.33	Delays in land acquisition
2	X3.2	4.62	Delays in procurement of materials and tools	X5.7	3.95	Weather conditions; heavy rainfall or extreme weather (wind and smoke)
3	X5.13	4.57	Force majeure conditions such as natural disasters, epidemics, and political risks	X3.6	3.81	Lack of control over the work schedule by contractors
4	X5.7	4.48	Weather conditions; heavy rainfall or extreme weather (wind and smoke)	X5.4	3.81	Complicated licensing issues
5	X3.8	4.33	There is no match between the number of human resources with existing work activities	X8.4	3.81	Inaccurate detailed engineering design planning data resulting in frequent design reviews

6. Conclusion

Based on the results of research and analysis that has been done, it could be concluded:

1. In the process of controlling the Indralaya - Prabumulih Toll Road project, there are 94 activities were identified which were grouped based on the knowledge area in the monitoring and controlling process group in PMBOK 6th

Edition, including: Project Integration Management, Project Scope Management, Project Schedule Management, Project Cost Management, Project Quality Management , Project Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management and Project Stakeholder Management. There is 1 (one) activity that has not been carried out on the project, namely "a show cause meeting (SCM) was conducted to evaluate any indications of delay".

2. The identified risks in the control process are 81 risks and the risks are grouped into eleven groups taken from the input process group, tools and techniques in the process of monitoring and controlling project in PMBOK 6th Edition with the addition of one variable, namely "Perform Integrated Change Control".
3. From the results of the analysis using the RII method, it was found that there were 5 highest risks on the risk to the impact on the project and also 5 risks to the frequency of occurrence, with “delays in land acquisition” as the highest risk in both.

References

A Guide to Project Management Body of Knowledge PMBOK 6th Edition. (2017). Pennsylvania: Project Management Institute, Inc.

Alam, T. (2011). Identifikasi Faktor - Faktor Risiko Proyek Rancang Bangun (Design and Build) pada XYZ yang Berpengaruh Terhadap Kinerja Waktu. *234/FT.01/TESIS/07/2011*, pp. 16.

Assaf, & Al-Hejji., Causes of Delay in Large Construction Projects. *International Journal of Project Management Vol. 24*, p.349-357,2006.

Departemen Pekerjaan Umum. (2007). Sistem Manajemen Risiko Proyek (Project Risk Management). *Sistem Manajemen Risiko Proyek*, III.1.

Gunadharma, Horem, Riad, & Samudra., Pekerjaan Konstruksi Rancang Bangun (Terintegrasi) Design and Build. *Otoritas Jasa Keuangan*, Jakarta,2019.

Harahap, K., Nurcahyo, C. B., & Putri, Y. E. (2013). Analisa Risiko pada Proyek Pembangunan Jalan Tol Nusa Dua - Ngurah Rai - Benoa, Bali. *Tesis*, Surabaya.

Leonardo, K. (2011). Analisa Risiko Fungsi Jabatan Organisasi pada Pelaksanaan Proyek Konstruksi Berbasis PMBOK 2008 (Studi Kasus pada Unit Konstruksi PT.X). *Tesis*.

Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia. (2018). Tempat istirahat dan Pelayanan pada Jalan Tol. *Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 10 / PRT / M / 2018*, 2.

Pertiwi, H., Implementasi Manajemen Risiko Berdasarkan PMBOK untuk Mencegah Keterlambatan Proyek Area Jawa Timur (Studi Kasus : Pt. Telkom). *Jurnal Studi Manajemen dan Bisnis Vol 4 No. 2*, pp. 96-108,2017.

PT. Hutama Karya. (2015). *Trans Sumatera Menghubungkan Kebaikan*. Retrieved from PT. Hutama Karya: https://www.hutamakarya.com/trans-sumatera

Rantung, B. T., Dundu, A. K., & Tarore, H., Pengelolaan Risiko pada Pekerjaan Pembangunan Jalan Tol Manado - Bitung (Sta. 9+700 s/d Sta. 11+700). *Jurnal Sipil Statik Vol. 6 No. 5*, pp 357, 2016.

Ronald, M., Simanjuntak, A., & Sudibyo, B. (2020). Identifikasi Faktor dan Variabel Risiko Kontrak Design and Build pada Proyek Simpang Susun Semanggi. *ISBN : 978-602-51450-2-5*.

Santosa, A. W., Risk Management Analysis of Building Construction Project in the Jakarta . *Jurnal Fondasi Volume 9 No. 1*, pp. 54-61, 2020.

Setiawan, A., Walujodjati, E., & Farida, I., Analisis Manajemen Risiko pada Proyek Pembangunan Cisungdawu (Studi Kasus : Development of Cileunyi - Sumedang Dawuan Toll Road Phase 1). *ISSN : 2302-7312 Vol. 11 No. 1*, pp 3-5, 2014.

Sugiyono. (2012). *Memahami Penelitian Kualitatif.* Bandung: ALFABETA.

Wena, M., & Suparno., Manajemen Risiko dalam Proyek Konstruksi. *Jurnal Bangunan Vol. 20 No.1, 2015.*

Biography

Reisha Ananda Putri is a magister student majoring Construction Management of Department of Civil Engineering from University of Indonesia. She received her Bachelor Degree of Civil Engineering at Indonesia University of Education in 2017. Currently she is working on the Trans Sumatra Toll Road project and the main goals in this research is to implement the knowledge gained from her research into the place that she works at.

Yusuf Latief is currently a fulltime senior lecturer and Professor Civil Department Faculty of Engineering University of Indonesia, Jakarta, Indonesia. He earned B.S., Masters and Doctoral in Civil Department Faculty of Engineering University of Indonesia, Jakarta, Indonesia. He has published journal and conference papers. His research interests in project management include construction management.

Appendices

Appendix I. Activities in Monitor and Control Process of JTTS Project

AREA		ACTIVITIES
X1	***Project Integration Management***	
X1.1	*Monitor & Control Project Work*	Compare actual project performance with the project management plan
		Assess performance periodically to determine if any corrective or preventive actions are indicated, and then recommend such actions as needed
		Checking the status of future project risks
		Manage accurate information on a regular basis about the project and display the project completion plan
		Provides information to support status reporting, project progress, and forecasts
		Updating estimated cost information and updated schedule
		Monitor implementation of approved changes
		Report project progress and status to management
		Ensuring projects stay aligned with business requirements
X1.2	*Perform Integration Change Control*	Evaluate related to change requests
		Approve and manage changes so that they are implemented in accordance with project documents and project management plans
		Communicating the decisions taken
X2	***Project Scope Management***	
X2.1	*Validate Scope*	Identify changes in project scope against requirements and acceptance criteria
		Review and evaluate the results/products of the project scope of work
		Submitting and documenting products/works that meet the acceptance criteria officially approved by the client
		Contractor submits a request for an inspection of the handover of the work (PHO)
		Contractor makes repairs to the list of work that must be repaired (defect list)
		Contractor submits a request for the final handover of work (FHO)
X2.2	*Control Scope*	Identify and evaluate changes that affect the project scope of work

		Contractors make a list of changing works and apply for additional/less (CO) work approvals to clients
		Carry out project scope change control system
		Make a request for variation order approval if there is a change in scope
		Study and understand contract documents
		Contractor makes work methods
		Contractor makes Work Breakdown Structure
		Contractor formulate technical analysis
		Contractor plan the scope of procurement of materials / tools / labor and sub-contractors
X3	***Project Schedule Management***	
X3.1	*Control Schedule*	Contractor makes a Master Schedule in the form of an S Curve and is signed by the Project Director, Supervising Consultant and Contractor
		Contractor makes daily reports, weekly reports and monthly reports
		Contractors carry out weekly and monthly progress updates to evaluate the progress of work progress
		Contractor makes a schedule based on WBS or a schedule based on BIM and displays resources both material, tools and human resources and shows the relationship between activities that have been signed by all parties
		Contractors carry out monthly progress updates in accordance with the realization of weekly progress reports to evaluate the time implementation
		Contractor makes network diagram plans that are tailored to the Work Breakdown Structure
		For work progress that is dominant in material procurement progress, a separation is made between the special realization of physical work and the special realization of material procurement so that evaluation and comparison can be made between plans and realizations with the same scope
		Make a action plan which contains an acceleration plan for late activities to return activities so that the final project plan is in accordance with the Master Schedule
		Make a report and determine the position of the project in terms of time, so that the suitability of project implementation is identified against the planned time or sooner or later than the plan with a time scale (days, weeks or months)
		Identify changes to the critical path, work completion time and float, due to changes in scope, time and quality
		Analyze the evaluation of work items that deviate from the baseline schedule plan, to find out the causes and trends of delays and accelerations that occur
		Respond to schedule changes that have been, are or may occur and develop and implement them to maintain project targets
		Determine the need for a fast tracking or crashing schedule
X4	***Project Cost Management***	
X4.1	*Control Cost*	Develop and implement a project cost control system

		Make cost realization reports, analyze the trend of cost deviations, the causes of deviations, change data and plan changes
		Perform calculations of the remaining Execution Budget Plan in accordance with the real work based on the analysis of the trend of cost deviations
		Evaluate resource planning (over minder) related to unit price increases, scope changes, time changes, less work, overwork due to changes in work methods
		Perform periodic updating of project cash flows due to changes in costs, scope, payment procedures/term
		Carry out continual improvement in an effort to improve performance related to project costs
		Contractor makes work volume requirements and Mutual Check (MC-0)
		Contractor makes Project Management report (covering monthly billing fee against annual plan)
		Make a trend analysis of cost deviations and evaluate the causes
X5	***Project Quality Management***	
X5.1	*Control Quality*	Contractor submits documents of Construction Implementation Quality Plan, Environmental Management and Monitoring Work Plan, Work Traffic Management Plan and Construction Safety Plan
		Conduct a Pre Construction Meeting (PCM) before the start of construction
		Attach Shop Drawings, Work Method Statements and Inspection and Test Plans (ITP) as applications for work permits
		Contractor makes an application for shop drawing approval
		Contractor makes submissions to measurement data
		Contractor makes a work implementation plan (work method)
		Contractor submits applications for product quality evaluation and control
		Monitor work according to project specifications to ensure compliance with requirements (relevant quality standards)
		Carry out inspections, reviews, and evaluations to ensure that the work results are well documented as accepted, rejected or reworked
		Clarifying the fulfillment of product quality
		Identify any deviations from the plan, both at the time of inspection and from the results of tests that have been carried out
		Conduct evaluation and analysis in order to carry out continual improvement of the causes of deviations and deviation tendencies
		Make complete reports and documentation related to the quality of work periodically
X6	***Project Resource Management***	
X6.1	*Control Resources*	Monitoring expenditures related to resources
		Identify and deal with resource shortages/overloads in a timely manner
		Ensure that resources are used and released according to project plans and requirements
		Inform relevant stakeholders if any problems arise regarding resources
		Provide input on factors that can make changes in resource utilization, and manage actual changes as they occur

X7	***Project Communication Management***	
X7.1	*Monitoring Communications*	Perform analysis, identification and evaluation of plans and realization
		Make performance reports (status, progress, project forecasting) to stakeholders (internal & external) carried out on time periodically
		Conduct periodic coordination meetings for evaluation and recommendations for future work plans
		Doing document control
		Contractor makes daily, weekly and monthly reports
		Contractor makes monthly Building Information Modeling (BIM) reports
		Create external reports containing weekly reports, monthly reports and BIM reports
		Contractor makes weekly drone video reports
X8	***Project Risk Management***	
X8.1	*Monitor Risks*	Monitoring and controlling risk response to identify new risks, reassess risks and cover past risks
		Perform measurement and documentation of actual risk events to make comparisons and evaluations against risk response plans periodically
		Make an update of the risk response plan if there is a change in the realization of the response so that the level of risk can be eliminated as small as possible
		Perform a comparison analysis of the number of possible risk reserves that still exist with the risks that still exist in the project
		Conducting meetings to discuss risk management
		Create identification, documents and risk reports for recommendations for improving project risk control for applications in future projects
		Evaluate the effectiveness of the risk process throughout the project
X9	***Project Procurement Management***	
X9.1	*Control Procurement*	Monitor contract performance and make appropriate changes/corrections and close contracts
		Carry out data collection and management of project records, including maintenance of detailed records of physical and financial performance and establishment of measurable procurement performance indicators
		Collect, analyze, and report data and project preparation related to the provision of periodic reports to the organization
		Monitor the procurement environment so that implementation can be facilitated or adjustments must be made
		Make a contractor/vendor performance report
		Reviewing and evaluating the procurement performance of contractors and vendors
		Doing documentation, management and claims
		Monitoring, controlling and recording the implementation of contractor/vendor procurement
		Make addendum to contractor/vendor contract
X10	***Project Stakeholder Management***	
X10.1		Contractor is obliged to request written approval of the design details from the relevant agency

	Monitor Stakeholder Engagement	Contractor provides assistance to owner regarding design revisions to the correction of the Toll Road Regulatory Agency (BPJT) until approval of the Final Engineering Plan by BPJT in writing is obtained
		Make external reports in the form of weekly reports and monthly reports submitted to related Ministries, Institutions and Agencies (Stakeholders)

Appendix II. List of Risks of Monitoring and Controlling Process in Trans Sumatera Toll Road

VARIABLE SOURCE OF RISK		**VARIABLE TYPE**	
X1	*Project Management Plan*	X1.1	Lack of preliminary survey of the project site
		X1.2	Discrepancy between the plan drawings and the real conditions at the project site
		X1.3	There are differences in technical specifications, drawings and bill of quantity
		X1.4	Lack of information and regulations regarding the implementation of design projects
		X1.5	Unclear project scope definition in the Terms of Reference
		X1.6	Clarity regarding the final criteria for the design and build work that will be produced
		X1.7	Project size as a comparison to similar projects for implementing design and build work
		X1.8	The complexity of the design and build scope of work
		X1.9	There is no contractor input to the design team (building knowledge) during design development
		X1.10	Improper project scheduling
X2	*Project Documents*	X2.1	Clarity and completeness of implementation documents
		X2.2	Data completeness system and contract administration
		X2.3	Design document error
		X2.4	Incomplete design details
		X2.5	Inadequate project documentation
		X2.6	Errors in understanding technical matters regarding construction and working methods
		X2.7	Damage/lost documents, pictures, files, important letters
X3	*Work Performance Information*	X3.1	Delays in land acquisition
		X3.2	Delays in procurement of materials and tools
		X3.3	Delay in drawings approval, materials and implementation permits
		X3.4	Rework due to quality of work that does not meet specifications
		X3.5	Delays in obtaining permits/Site Acquisition and Litigation/electricity/third parties
		X3.6	Lack of control over the work schedule by contractors
		X3.7	Realization of the implementation of work that is not in accordance with what has been agreed in the design development
		X3.8	There is no match between the number of human resources with existing work activities
		X3.9	The project supervision process is not going well
		X3.10	Loss of materials and equipment during project implementation
		X3.11	Use of inappropriate work methods so that work becomes late
		X3.12	There are work accidents due to errors in construction methods
X4	*Agreements*	X4.1	The contract system used includes the terms of the contract

		X4.2	The project scope is not clear and in detail related to project fulfillment targets
		X4.3	Differences in perception between what is desired by service users and the implementation carried out by service providers
		X4.4	Compliance with project contract documents and specifications used in the project
		X4.5	Clarity regarding the final criteria for the design and build work that will be produced
		X4.6	Incomplete, unclear, ambiguous project clause
		X4.7	Change of contract type, condition, or rule
		X4.8	The duration of the contract/PO is too short
		X4.9	Late payment
		X4.10	Delay in making a contract addendum
		X4.11	Delays in the process of making contract documents
		X4.12	The existence of a contract addendum due to the many wishes of the owner to make changes during the implementation process
X5	*Enterprise Environmental Factors*	X5.1	Changes in the organizational structure of the owner
		X5.2	Technological changes that lead to design reviews or variation orders
		X5.3	Equipment mobility that is difficult to get to the site
		X5.4	Complicated licensing issues
		X5.5	Availability of funds
		X5.6	Cultural conditions and customs of the community around the project site
		X5.7	Weather conditions; heavy rainfall or extreme weather (wind and smoke)
		X5.8	Reporting on counter-productive print journalism and electronic media regarding the implementation of toll roads
		X5.9	There is a change in the structure / responsibility of government agencies in handling ongoing projects
		X5.10	Bad company politics
		X5.11	The condition and environment of the site is not in accordance with the initial design document
		X5.12	Changes in the situation due to government policies
		X5.13	Force majeure conditions such as natural disasters, epidemics, and political risks
X6	*Organizational Process Assets*	X6.1	Post-project maintenance
		X6.2	Damage to project construction equipment, low productivity of equipment/machines
		X6.3	Risks to property belonging to the project or under its responsibility
		X6.4	Fires, explosions, damage to crops, forests, artistic and cultural objects
		X6.5	The equipment used is not feasible and cannot be used to complete the work according to the schedule
X7	*Expert Judgment*	X7.1	Misunderstanding and application of concepts to existing problems by experts
		X7.2	Inadequate expertise and expert experience related to the problem at hand
X8	*Data Analysis*	X8.1	There was an error in calculating the volume of work by the planning consultant, causing additional work at the time of project implementation
		X8.2	Estimated time and cost that are not balanced
		X8.3	Error in calculating project realization value
		X8.4	Inaccurate detailed engineering design planning data resulting in frequent design reviews

		X8.5	The number of jobs that have conditions of uncertainty (unforeseen conditions)
X9	*Decision Making*	X9.1	Local Government Policy
		X9.2	Information received is invalid
		X9.3	There are requests and refusals from the Regional Government and the surrounding community
		X9.4	Delays due to the length of time the decision is taken or the disapproval of the necessary acceleration steps
		X9.5	Understanding of the design team in estimating the time duration of each activity in design and build work
		X9.6	Delay in reaching a design agreement during design development due to differences in the perception of the owner and the design team
X10	*Meetings*	X10.1	Lack or slow coordination between agencies
		X10.2	Communication skills between personnel involved in the implementation of design and build work
		X10.3	There was a miscommunication during the discussion of the problem
X11	*Integrated Change Control*	X11.1	Design changes due to changes in field conditions
		X11.2	There is a request or refusal from the local government or the surrounding community
		X11.3	Frequent design changes in the middle of work
		X11.4	There is a new item in the work that is not yet in the List of Materials
		X11.5	Change of scope of work
		X11.6	Changes in planning and specifications