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ANALYSIS OF THE DELAY IN THE IMPLEMENTATION OF TOLL ROAD PROJECT WORK

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ABSTRACT

Infrastructure development is a key element in the economic development of a country, including Indonesia. In the last decade, infrastructure development in Indonesia has increased significantly, especially toll road projects. The government through the Ministry of PUPR is committed to developing infrastructure in order to achieve the vision of "Golden Indonesia" 2045. However, many projects experience delays, negatively impacting cost, quality, and completion time. This research analyzes the factors causing delays in toll road projects, with case studies on two projects in Sumatra, one in Java, and one in Kalimantan. The research methods include literature study, data collection, questionnaires to project owners, supervision consultants, and contractors, and analysis of questionnaire results. Of the 24 respondents, it was found that land unfree issue, improper scheduling, lack of resources, and unforeseen situations were the dominant factors of delay. Further analysis showed that of the 16 causes of land/land-related delays, 5 were from non-technical aspects and 13 were from technical aspects, with two related causes, namely incomplete types and work items on the contract and unexpected situations. The average risk value shows that the delay factor related to land/land has a higher value than other factors. For toll road projects, the technical aspect risk score is 10.75 and non-technical is 12.33 out of a maximum risk score scale of 25. These findings emphasize the importance of land/land risk management in improving efficiency and effectiveness in the implementation of toll road projects. This research is expected to help future project management, increase the knowledge of civil engineers, and support the growth of existing Infrastructure development in Indonesia.

KEYWORDS *Delay, toll road project, dominant factors*

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INTRODUCTION

Infrastructure development is one of the main pillars in realizing the vision of a Golden Indonesia 2045. Toll road infrastructure plays a crucial role in supporting economic growth and national resilience. Toll roads, as an integral part of the national transportation system, require users to pay tolls in accordance with Government Regulation Number 15 of 2005. Indonesia is actively implementing the construction of the Trans Sumatra Toll Road project which has a total length of 2,812 kilometers with a budget of IDR 538 trillion. In addition, toll road projects are also underway on the islands of Sulawesi and Kalimantan to support preparations for the construction of the new national capital. However, infrastructure development often faces significant challenges, especially regarding delays in project implementation. Field facts show that some toll road projects have experienced delays, such as one of the Toll Road projects in Java that experienced delays of up to 12 months. This study aims to identify the dominant factors that cause delays in the implementation of infrastructure projects, especially toll roads. By understanding the root of this problem, it is expected that strategic steps can be taken to improve the efficiency and effectiveness of project management in the future. This research is also expected to make a valuable contribution to the development of science in the field of civil engineering and construction management, and support the sustainable growth of national infrastructure development.

A project is an endeavor within a specified period of time with a clear goal of achieving results that have been formulated at the time the project development will begin (Hidayat, 2022). According to Juansyah et al., (2018), in the context of organizations, management is considered an inseparable element. This is because any organization that does not involve the process of planning, organizing, actuating, and controlling (POAC) will tend to have difficulty in achieving its goals and running its operations effectively.

Planning involves a planning process that includes setting goals, identifying necessary resources, and developing strategies to achieve those goals. Organizing: Organizing involves setting up an organizational structure, allocating resources, and assigning responsibilities. Actuating includes steps to carry out the plans that have been made. Controlling is the process of monitoring and evaluating the organization's performance to ensure that activities are in accordance with the plan.

Construction project delays

Delays in construction projects refer to the inability to complete construction work according to the schedule set in the construction contract. According to Levis and Atherley in Langford (2021), project delays can be classified into three main types. First, Excusable Non-Compensable Delays is a type of delay that can be forgiven because it is caused by factors beyond the control of the parties involved in the project. Examples of these factors include changes in government regulations, extreme weather, or unavoidable force majeure events. Secondly, Excusable Compensable Delays are also delays that can be forgiven because they are caused by external factors. However, the difference lies in the possibility of obtaining compensation for the delay. Third, Non-Excusable Delays are types of delays that

cannot be forgiven because they are caused by factors that should have been controlled or overcome by the parties involved in the project, such as delays in the supply of materials or failure to meet set deadlines.

Risk Management

In managing project risks that are appropriate to the characteristics and scale of the infrastructure project at hand. This approach involves evaluating risks based on certain criteria to assess the likelihood and impact of risks that may affect project continuity. Risk likelihood criteria are assessed in 5 levels ranging from Very Small to Very Large, using various approaches such as consensus of risk assessment participants, technical documents, historical data, expert opinion, or recent research results (Yurianto & Kadri, 2020).

Meanwhile, risk impacts are categorized into 5 levels for negative risks (Insignificant, Minor, Moderate, Significant, Catastrophic) and 5 levels for positive risks (Insignificant, Minor, Moderate, Significant, Very Significant). Risk impact assessments are conducted using a similar approach, with reference to relevant factors and internal company criteria.

Risk measurement uses the simple formula R = P x I, where R is the level of risk obtained from multiplying the likelihood of a risk occurring (P) and the impact it may have (I). This process involves a projective assessment to evaluate how often the risk may occur and how much impact it may have on the project objectives. Risks are classified using a Likert scale of 1 to 5, allowing the risk management team to identify and categorize risks ranging from those with low likelihood and minimal impact to those with high likelihood and significant impact. This approach helps in designing appropriate response strategies to mitigate or manage risks, as well as increase the chances of project success by reducing the uncertainty that may arise.

RESEARCH METHOD

Research approach

This research uses a quantitative approach to investigate the constraints that arise during the implementation of Infrastructure Projects in the General Civil Division of PT Hutama Karya (Persero). This approach uses systematic data collection methods to be analyzed statistically, with the aim of producing generalizations that can be applied to a larger population.

Data source

The data sources in this study consist of primary and secondary data. Primary data was obtained from distributing questionnaires. The questionnaire was designed based on preliminary data and previously collected project information. The questionnaire was distributed to three main groups of respondents: Owner, Supervision Consultant, and Service Provider (Contractor). This made it possible to obtain the views of the various parties directly involved in the project (Rossela & Hudori, 2021). Secondary data was obtained by identifying and collecting information from secondary sources such as previous similar studies. This secondary data is used to support the analysis of primary data obtained from

distributing questionnaires. This data was included to validate the findings and to gain additional insights into best practices and experiences from similar projects.

Respondents

The questionnaire distribution technique used in this study was purposive sampling or judgmental sampling. This technique is part of a non-probability sampling method in which researchers select respondents based on certain characteristics relevant to the research objectives. In the context of this study, respondents were selected based on their roles and responsibilities in the Toll Road project.

The selection of respondents was done to ensure that the data collected came from individuals who have knowledge and experience relevant to the research topic, so that the results of the analysis can provide deep and accurate insights into the factors of delays in infrastructure projects (Astina et al., 2012).

The research respondents consisted of three main groups involved in the Toll Road project under study. First is the Service User (Owner), consisting of PPK Pelaksana/Pimpro (4 people) and Directors of Works/Control Manager (4 people). Second is the Supervision Consultant, consisting of Team Leader (4 people) and TA & Chief Inspector (4 people). Third is the Service Provider (Implementing Contactor), consisting of Project Managers (4 people) and SEM / SOM (4 people). The total number of respondents who will be taken to fill out the questionnaire is 24 people, which are divided according to their roles and responsibilities in project implementation.

Research instruments

This research instrument includes primary and secondary data collection. Primary data was obtained through distributing questionnaires, and secondary data was obtained from literature studies. Data collection was carried out by distributing and retrieving questionnaire forms that had been designed to meet the needs of this research. The questionnaire form contains questions related to delay factors in toll road projects. These questions are organized using a Likert scale of 1-5, which is divided into an influence column and a probability column (Fahlevi et al., 2019).

The distributed questionnaires will be analyzed using content analysis and ranking to determine the dominant factors causing delays in toll road projects. The questionnaires were distributed to three groups of project stakeholders: project owners, supervision consultants, and implementing contractors (Yudhagama, 2020).

The factors of project delay were grouped based on POAC (Planning, Organizing, Actuating, Controlling) aspects. In the planning aspect, factors included low bid price, land that was not yet free, incomplete work items on the contract, and improper scheduling. In the organizing aspect, factors included insufficient supervision, management changes, lack of technical personnel, and poor communication. On the execution aspect, factors include material shortages, equipment breakdowns, financial difficulties, and weather conditions. In the control aspect, factors include delayed working drawing process, unscheduled material sample delivery, and long material sample approval time.

Analyze the likelihood and impact of delays using the Risk Management Procedure, with risk criteria from very small to very large and risk impact from insignificant to catastrophic. Risk likelihood criteria consist of: very small (Index = 1), small (Index = 2), medium (Index = 3), large (Index = 4), and very large (Index = 5). Risk impact criteria consist of: insignificant (0 < Deviation < 5%, Index = 1), minor (5% < Deviation < 10%, Index = 2), moderate (10% < Deviation < 15%, Index = 3), significant (15% < Deviation < 20%, Index = 4), and catastrophic/very significant (Deviation > 20%, Index = 5).

Data collection procedure

This study uses data collection methods by distributing and retrieving questionnaires. The questionnaires are distributed directly to the selected respondents by providing detailed instructions on how to fill in and the deadline for return. Respondents will be asked to complete the questionnaire using a Likert scale to measure the influence and probability of occurrence of delay factors. This distribution process is carried out with supervision to ensure that each respondent gets the questionnaire properly and can fill in according to the predetermined conditions. After the questionnaire filling period ends, the questionnaires will be withdrawn. The collected questionnaires will be checked to verify the completeness and accuracy of the collected data.

RESULT AND DISCUSSION

This research aims to identify factors that affect the implementation time of toll road projects and inform the dominant factors that affect the implementation time of the project. Through this research, it is expected to find and understand the most significant factors in causing delays, so that appropriate corrective measures can be taken to improve efficiency and effectiveness in the implementation of Toll Road projects.

1. Results of Questionnaire Distribution and Withdrawal

The distribution of respondent agencies includes 8 project owners (Owner), 8 supervision consultants, and 8 contractors, so the total number of respondents is 24. Based on work experience, no respondents have less than 5 years of work experience. A total of 3 respondents had work experience between 5 to 10 years, 9 respondents had work experience between 11 to 15 years, and 12 respondents had work experience of more than 15 years. In terms of education level, none of the respondents had a D3 education, while 20 respondents had a D4 or S1 education, and 4 respondents had a S2 education.

2. Risk Score Results

From the analysis of the risk results, it was found that the highest risk value (extreme risk value with a value of 16), on the toll road project showed three delay factors, namely: A2 (unfree land), A8 (improper scheduling and planning), C10 (lack of fulfillment of tools, materials, and human resources).

The first factor (A2) identified that the issue of unacquired land is common in Indonesia and should ideally be resolved before construction begins. Works contracts only mention the responsibility of the service provider without a specific clause on land handover. These problems are caused by lengthy legal and licensing processes, determination of fair compensation, and resistance from disgruntled communities.

The second factor (A8) is known to be inappropriate scheduling and planning. Schedules are often too short and optimistic without taking into account risks such as land, design and resource issues. Additions or changes to the scope of work, limited resources, and slow decision-making also contribute to delays.

The third factor (C10) shows the lack of fulfillment of tools, materials, and human resources. This was caused by poor planning and limited resources at the project site. Inaccurate estimation of needs, insufficient budget, and the absence of an effective inventory system exacerbated this condition.

Table 1. Dominant Causes of Toll Road Project Delays

Ranking	***Code***	***Delay Factors***	***Risk Value***
1	A2	Land that is not yet free by service users	19.96
2	A8	Improper scheduling and planning	18.79
3	C10	Lack of resources at the job site, both labor and materials	16.25
4	A1	Low bid price by Contractor	14.71
5	C12	Unexpected situations such as heavy rains, hurricanes, earthquakes, and floods, etc.	14.63
6	C1	There are changes to the design and specifications	13.71
7	D8	Theft of materials and tools at the project site	10.50
8	C9	Slow utility relocation	10.42
9	C7	Poor subcontractor performance that disrupts productivity	10.33
10	D2	Example of materials delivered by an unscheduled contractor	9.83
12	A4	Incomplete drawings and specifications	9.63
13	C3	Damage to equipment while working / Poor tool condition	9.50
14	C8	Lack of Material resource space	9.21
15	A7	Contract value is smaller than the expected output/product. (Need additional contract value exceeding 10%)	8.71

*From a maximum score of 25, a minimum of 1.

3. Causes of Toll Road Project Delays

Table 2, Factors of Toll Road Project Delay Seen from the Stakeholder's Point of View

Ranking	*Code*	*Delay Factors*	*Risk Value**
		Project Owner	
1	A 2	Land that is not yet free by service users	20.13
2	A 8	Improper scheduling and planning	18.63
3	C 10	Lack of resources at the job site, both labor and materials	17.38
		Supervision Consultant	
1	A 2	Land that is not yet free by service users	19.75
2	A 8	Improper scheduling and planning	18.38
3	C 12	Unexpected situations such as heavy rains, hurricanes, earthquakes and floods	16.25
4	C 10	Lack of resources at the job site, both power tools and materials	16.00
		Contractor	
1	A 2	Land that is not yet free by the Service User	20.00
2	A 8	Improper scheduling and planning	19.38
3	C 1	There are design and specification changes	16.63

*From a maximum score of 25, a minimum of 1.

In toll road projects, all three groups of respondents agreed on two main causes of delays that are faced together. First, issues related to land that has not been freed from service users, which hampers the construction process and causes delays. Second, improper scheduling and planning, which resulted in inefficiency and misalignment in project implementation. These two factors, according to the respondents' agreement, are significant causes that need to be addressed effectively to reduce delays in toll road projects. The following is a Venn diagram of the views of the project owner, contractor and supervision consultant on the delay factors affecting the toll road:

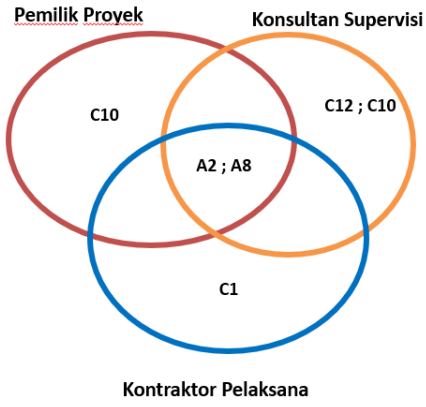

Figure 1. Venn Diagram of Top Rankings Causes of Toll Road Project Delays

4. Causes of Delay Based on Technical and Non-Technical Factors

If the factors causing delays are disaggregated again with a focus on land and soil issues, a total of 16 causes of delays are obtained. Of these, there are 5 causes related to non-technical aspects and 13 causes related to technical aspects. Non-technical aspects relate to elements that are not directly related to technology or technical processes, but are important in the overall context of a project or system. These include factors that are more human, organizational, and social in nature. Whereas Technical Aspects refer to elements that relate to technology, methodologies, and technical specifications (Honrao & Desai, 2015). It includes everything related to the technology or process used to achieve a particular goal.

Table 3. Risk scores based on technical & non-technical aspects related to land and soil

Ranking	*Code*	*Delay Factor Aspect*	*Risk Value*	*Group*
1	A 2	Land that is not yet free by service users	19.96	Non-Technical
2	A 3	Types and items of work on the contract are incomplete	8.38	Non-Technical
3	A 4	Incomplete drawings and specifications	8.38	Technical
4	A 8	Improper scheduling and planning	9.50	Technical
5	A 9	Work sequence plan that is not well structured or integrated	18.79	Technical
6	A 10	Incorrect or improper construction method/work execution	6.04	Technical
7	C 1	There are changes to the design and specifications	7.13	Technical
8	C 3	Equipment malfunction while working / poor tool condition	13.71	Technical
9	C 6	Slow mobilization of resources, including labor, materials, and tools due to hard-to-reach project locations	9.21	Technical
10	C 7	Poor subcontractor performance that disrupts productivity	8.54	Technical
11	C 8	Shortage of material resources	10.33	Technical
12	C 9	Slow utility relocation	9.21	Non-Technical
13	C 10	Lack of resources at the job site, both tools and manpower	16.25	Technical
14	C 12	Unexpected situations such as heavy rain, hurricanes, earthquakes, flooding	14.63	Non-Technical
15	D 1	Delayed working drawings process both contractor and service provider issues	8.33	Technical
16	D 5	Slow work permit application process	8.29	Non-Technical

Based on the analysis conducted, the factors causing project delays related to land issues have been sorted into 16 causes, consisting of 5 causes related to non-technical aspects and 13 causes related to technical aspects. In this case, there are two causes of delay that are interrelated between technical and non-technical

aspects, namely causes coded 'A3 Types and items of work on the contract are incomplete' and 'C12 Unexpected situations such as rain, earthquakes, floods, etc.'.

The results of the analysis show that the average risk value obtained from causes of delay related to land and technical and non-technical aspects is higher than the risk value obtained from causes of delay that only involve technical or non-technical aspects separately. For toll road projects, the risk value related to technical aspects related to land was recorded at 10.75, while the risk value for non-technical aspects related to land reached 12.33.

CONCLUSION

Based on the results of the analysis of project delay factors that have a risk value above 16 (extreme) as follows. For Toll Road Projects Land that has not been freed by service users (Risk value 19.96); Improper scheduling and planning (Risk value 18.79); Lack of resources at the work site, both power tools and materials (16.25). If grouped further, specifically the delay factors that are only related to land & earthworks based on technical and non-technical aspects, it turns out that the non-technical aspect factors have a greater average risk value (12.33) compared to the average risk value based on technical aspects, which has a risk value (10.75).

I would like to thank PT Hutama Karya (Persero) for providing the opportunity and facilities needed for this research. My thanks also go to the respondents who have taken the time to participate and provide very valuable data for this study. Finally, I realize that this research still has shortcomings. Therefore, constructive criticism and suggestions are very much expected for future improvements.

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