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# *Risk Identification And Mitigation Of The Ulapan Electric Train Construction Project In Gianyar District*

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**Abstract— Efforts to improve tourism in the ULAPAN area (Ubud, Tegallalang, Payangan) are carried out by connecting ULAPAN with other areas in Bali through the ULAPAN Electric Train Development Project Planning. Various risks are possible in the implementation plan of the ULAPAN Electric Train Development Project. To minimize the impact and possibility of risks in the ULAPAN Electric Train Development Project, risk management is needed. This study uses a qualitative research method, namely by brainstorming and interviewing parties involved and competent in the Electric Train Development Project with a total of 28 respondents. The likelihood of risk (likelihood) and the influence that occurs due to risk (consequences) are obtained through the answers given by the respondents, then a risk assessment can be carried out by multiplying the frequency mode value/likelihood of risk (likelihood) by the consequence mode value/risk influence (consequences). The risk identification obtained was 32 risks, namely 9 unacceptable risks (28.13%), 15 undesirable risks (46.88%) and 8 acceptable risks (25%). Dominant risks are risks that fall into the unacceptable and undesired categories. Proper risk management requires the allocation of risk ownership to related parties. Mitigation carried out against the risk of errors in construction time estimation with the largest risk value is by carefully recalculating and paying attention to priority work so that time is more efficient.**

**Keywords— risk, identification, assessment, mitigation, ULAPAN electric train**

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## I. INTRODUCTION

Each project has various risks, which are influenced by the complexity of a project. The definition of an Electric Train Project is a project built for a mode of transportation service in the form of a passenger train on a light rail. Lightweight construction is the reason electric trains generally operate in urban areas. The planning for the Ubud, Tegallalang, Payangan (ULAPAN) Electric Train Development was carried out to advance ULAPAN tourism by connecting the ULAPAN area with other areas in Bali. Problems or disasters certainly cannot be avoided in the ULAPAN Electric Train Development. Research related to risk management has not been found in the ULAPAN Electric Train development project plan. Therefore, the author conducted related risk management, risk identification, risk assessment and risk handling or mitigation in the ULAPAN Electric Train Development Project. Risk management is carried out to determine the level of assessment, acceptance, ownership and handling/mitigation of risks based on risk sources, namely political, environmental, planning, marketing, economic, financial, natural, technical, human, criminal, safety and projects, so that it can minimize the impact caused by risks both in the planning process and the implementation process of the ULAPAN electric train project

## II. METHODS

The method used must be determined in a study to facilitate and obtain a way to solve problems in the implementation of the study. The method used in this study is a qualitative method that is quantified or non-numerical data that is numeric to be able to convey a systematic and accurate description of an event and the relationship that occurs between the events studied. The data that is the guideline in this study is existing library data and previous similar studies that have been carried out. Observations and interviews were conducted to obtain data on existing problems in accordance with the scope of the discussion so as to obtain opinions or opinions from respondents who are experienced in the electric train project regarding the risk opportunities that can occur in the ULAPAN electric train construction project, Gianyar Regency. The data used, how to obtain data, and data processing techniques will be explained in this research method. The ULAPAN Electric Train Construction Project in Gianyar Regency is the object of this study, the areas passed by the construction of the ULAPAN electric train are Singakerta, Payangan, Kerta, Tegallalang, Tampaksiring and Goa Gajah with one station in each of these areas, so that the total planned stations made are as many as six stations. This study uses data collection techniques including observation and interviews. Data analysis techniques are techniques used to conclude the results of the research conducted. This study uses data analysis techniques as described in table 1. as follows:

Table 1. Data Analysis Techniques

| DATA | ANALYSIS | RESULT |
|---|---|---|
| Problem Formulation 1. What risks might occur in the planning and implementation of the construction of the ULAPAN electric train in Gianyar Regency, Bali, along with their sources?? | | |
| 1. Sources of Risk | 1. Identify the risks that may occur in the ULAPAN electric train project by brainstorming with the parties involved in the project. | Risk Identification Data |
| Problem Formulation 2. How is the risk assessment of the ULAPAN electric train construction project in Gianyar Regency, Bali? | | |
| 1. Questionnaire | 1. Analyze the consequences and frequency of risks based on questionnaire data. | Consequences and Frequency of Risk |

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|---|---|---|
| 2. Consequences and Frequency of Risk | 2. Conduct a risk assessment based on the results of multiplying the frequency mode value by the risk consequence mode value. | Risk Assessment and Acceptance |
| Problem Formulation 3. How is risk ownership and mitigation actions to minimize the impact of risks that occur? | | |
| 1. Risk Assessment | 1. 1. Analyze risk assessment data to determine ownership of the risk. | Risk Ownership |
| 2. Risk Ownership | 2. Conduct risk handling/mitigation analysis based on data from risk ownership. | Risk Mitigation |

## III. RESULT AND DISCUSSION

### Risk Identification and Assessment in the ULAPAN Electric Train Development Project, Gianyar Regency

The identifiable risks based on the research results on the ULAPAN Electric Train Development Project, Gianyar-Bali Regency are 32 (thirty-two) risks, including 3 (three) political risks (9.38%), 3 (three) environmental risks (9.38%), 4 (four) planning risks (12.50%), 1 (one) economic risk (3.13%), 2 (two) financial risks (6.25%), 2 (two) natural risks (6.25%), 4 (four) project risks (12.50%), 3 (three) technical risks (9.38%), 3 (three) human risks (9.38%), 3 (three) criminal risks (9.38%), 4 (four) safety risks (12.50%). More complete risk identification is described in table 2 as follows:

Table 5. Risk Identification Results Based on Risk Sources from Interviews and Literature Studies

| Risk Sources | Number | Risk Identification |
|---|---|---|
| Politics | 1 | Project is hampered by land acquisition |
| | 2 | Changes in government policy |
| | 3 | Contract violations cause project to stop |
| Environment | 4 | Complaints from the community around the project due to noise, vibration, dust and slums |
| | 5 | Complaints from road users around the project due to dirty roads due to the activities of project equipment |
| | 6 | The emergence of new diseases such as puddles, project waste, and debris that can become nests for animals that can endanger the health of project workers |
| Planning | 7 | Mistakes in estimating construction time |
| | 8 | Changes to the design of the plan drawing take too long |
| | 9 | Mismatches/errors in the planning design |
| | 10 | Delays in licensing |
| Economic | 11 | Increases in material prices |
| | 12 | Contractors do not pay on time |
| Finance | 13 | Mistakes in estimating construction costs |

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| | | |
|---|---|---|
| | 14 | Poor financial condition of the project |
| Natural | 15 | Natural disasters such as earthquakes, whirlwinds, storms, floods, landslides and volcanic eruptions |
| | 16 | Extreme weather changes such as rain in the dry season |
| Project | 17 | Lack of supervision in implementation |
| | 18 | Improper installation of heavy equipment |
| | 19 | Lack of materials needed at the project site |
| | 20 | Mistakes in placing materials at the project site |
| Technical | 21 | Improper implementation methods cause work delays |
| | 22 | Errors in the transportation and lowering of segmental girders at the project site |
| | 23 | Workers who are less competent in their fields |
| Humans | 24 | Lack of workforce |
| | 25 | Worker fatigue caused by the implementation of overtime |
| | 26 | Difficulty in communication in the field because workers only speak the local language |
| Crime | 27 | Theft or destruction of tools and materials during implementation |
| | 28 | Extortion carried out by individuals claiming to be from the community around the project |
| | 29 | Fraud carried out by suppliers |
| | | |
| | 31 | Lack of lighting when working at night |
| | 32 | Lack of signs or warning signs for dangerous areas |
| | 33 | Workers do not want to use Safety Equpment |

After the risk identification is obtained, questionnaires can be distributed to 28 (twenty eight) respondents from experienced and competent parties, namely the Bali Provincial Transportation Agency, the Bali Provincial Public Works and Public Housing Agency, the Gianyar Regency Transportation Agency, the Gianyar Regency Public Works and Public Housing Agency, the Gianyar Regency Tourism Agency, the Gianyar Regency Environmental Agency, Academics, Contractors and Community Leaders around the project area. The results of the distributed questionnaires were tested for validity and reliability using the SPSS (Statistical Product and Service Solutions) application program. Based on the validity and reliability tests, 32 valid and reliable statements were obtained. Risk assessment can be carried out if the risks have been declared valid and reliable, risk assessment is carried out by multiplying the mode value of the frequency (likelihood) by the mode of consequences (consequences) for each risk. The level of risk acceptability is determined based on the value obtained from the risk assessment with the results obtained, namely 9 (nine) risks with the unacceptable category (28.13%), 15 (fifteen) risks with the undesirable category (46.88%) and 8 (eight) risks with the acceptable category (25%). After the risk acceptance is obtained, a grouping is carried out so that the risk can be distributed to the parties according to their fields and responsibilities so that appropriate handling/mitigation actions can be taken. The highest risk ownership is on the Contractor's side, namely 6 (six) risks with the unacceptable category and 12 (twelve) risks with the undesirable category. Handling/overcoming actions are planned in risk mitigation with the aim that risks can be handled and minimized, namely on dominant risks (major risks), risks with the unacceptable category and undesirable. The mitigation actions that can be taken against dominant risks in this study are described in the form of table 3. and table 4. As follows:

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Table 3. Mitigation Actions for Unacceptable Risks

| Number | Risk Identification | Risk Mitigation |
|---|---|---|
| 1 | There is an error in the construction time estimate | - A careful recalculation of the construction time is carried out by paying attention to priority work so that time is more efficient |
| 2 | There is a change in the design of the plan drawing that takes too long | - Appoint an expert party related to the design plan and conduct a direct survey to the field so that the work is more efficient |
| 3 | here is an error in the planning design | - Make improvements to the design by conducting a field survey first so that the design does not experience errors |
| 4 | There is an error in the construction cost estimate | - Recalculate the cost estimate more carefully and carefully and involve a team of experts |
| 5 | There is an inappropriate installation of heavy equipment | - Create a work method related to the installation of heavy equipment, so that during the work process it can minimize errors |
| 6 | There is a delay in work due to an inappropriate implementation method | - Changes are made to the work method that is less effective and efficient and add workers if needed |
| 7 | There is an error in the transportation and lowering of the girder at the project site | - Plan the right method and calculation before carrying out the lowering of the girder at the work site |
| 8 | There is theft or destruction of tools and materials during implementation | - Tighten the security of the project area by recruit security personnel/security guards to guard the project area<br>- Carry out mandatory reporting of guests and checks on workers, every time they leave and enter the project area |
| 9 | There are workers who do not want to use PPE (Personal Protective Equipment) | - Make strict rules and sanctions for all parties involved in the project, to comply with the proper and correct use of Safety Equipment |

Table 4. Mitigation Actions for Undesirable Risks

| Number | Risk Identification | Risk Mitigation |
|---|---|---|
| 1 | Delay in project start due to land acquisition | - Provide socialization and negotiation to land owners regarding the project to be implemented and provide mutually beneficial solutions |
| 2 | Project constraints due to government policies | - Pay more attention to the latest/current government policies so that project constraints do not occur due to updated policies |

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| Number | Risk Identification | Risk Mitigation |
|---|---|---|
| 3 | Violation of project contract | - Create a clear and firm contract, as well as a solution to resolve violations by each party |
| 4 | Complaints from the community around the project due to noise, vibration, dust and slums. | - Cleaning the area around the project if there is no more work being done |
| | | - Conducting socialization with local residents regarding work that can cause vibrations and scheduling work so that it is not carried out at a time that can disturb local residents |
| 5 | The presence of new diseases due to stagnant water, garbage, and debris that can become nests for animals that can endanger the health of project workers | - Maintaining the cleanliness of the project area by carrying out routine cleaning |
| | | - Cleaning the area around the project and project waste that can become nests for disease |
| 6 | Delays in licensing | - Processing permits that have met administrative requirements so that there are no obstacles |
| 7 | Increases in the price of project materials | - Price adjustments are made with reference to the articles contained in the contract and price negotiations with the project owner |
| 8 | Conditions where project finances are poor | - Making construction cost planning and control in order to maximize the costs used on the project |
| 9 | Natural disasters such as earthquakes, whirlwinds, storms, floods, landslides and volcanic eruptions | - Preparing early anticipation of disasters such as pumps for dewatering in the event of a flood |
| | | - Insuring heavy equipment and vehicles |
| | | - Registering health insurance and employment of all workers involved in the project |
| 10 | There is less strict supervision in the implementation | - Tighten supervision of each job |
| | | - Choose a supervisory consultant with the criteria of someone who is experienced and competent |
| 11 | There is worker fatigue caused by the implementation of more working hours (overtime) | - Add workers so that work progress is faster and workers are not burdened by more working hours |
| 12 | There are illegal levies carried out by individuals who claim to be from the community around the project | - Build good communication with residents so as not to cause chaos and illegal levies, if necessary open up employment opportunities for residents around the project that do not require special skills |

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| Number | Risk Identification | Risk Mitigation |
|---|---|---|
| 13 | There is fraud carried out by the supplier | - Make a clear work agreement between the contractor and supplier and find suppliers who have integrity |
| 14 | There are work accidents during project implementation | - Conduct socialization and safety morning before carrying out work<br>- Require the use of good and correct safety equipment |
| 15 | There is a lack of signs or warning signs for dangerous areas | - Add warning signs to work areas that are prone to accidents |

## IV. CONCLUSION

There are 33 identifiable risks in the ULAPAN Electric Train Development Project, Gianyar Regency, Bali. After testing, there was 1 invalid risk, so analysis and retesting were carried out and 32 valid risks were obtained, including 3 (three) political risks (9.38%), 3 (three) environmental risks (9.38%), 4 (four) planning risks (12.50%), 1 (one) economic risk (3.13%), 2 (two) financial risks (6.25%), 2 (two) natural risks (6.25%), 4 (four) project risks (12.50%), 3 (three) technical risks (9.38%), 3 (three) human risks (9.38%), 3 (three) criminal risks (9.38%), 4 (four) safety risks (12.50%). The level of risk assessment is carried out by multiplying the likelihood mode with the influence mode/consequences, from the results of the assessment, risk acceptance can be carried out, so that there are 9 (nine) risks with the unacceptable category (28.13%), 15 (fifteen) risks with the undesirable category (46.88%) and 8 (eight) risks with the acceptable category (25%). Risks with the unacceptable and undesirable categories are dominant risks (major risks), so the number of dominant risks is 24 risks (75%).

The risks included in the dominant risks (major risks) are analyzed for ownership by distributing the risks to parties according to their fields and responsibilities. The largest risk ownership is with the Contractor, namely 6 (six) risks with the unacceptable category and 12 (twelve) risks with the undesirable category. Based on risk ownership, mitigation can be carried out for each risk with the aim that the risk can be handled or minimized. Mitigation was carried out on 9 risks in the unacceptable category, while mitigation was carried out on 15 risks in the undesirable category

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