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Risk Analysis on the Pejambuan Village Bridge Construction Project, Sungai Tabuk District, Banjar Regency, South Kalimantan

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ABSTRACT

Construction activities have a major impact on the economy and can drive various other sectors, so project management must be carried out very carefully. Without adequate monitoring, projects are at risk of facing various problems that can hinder their implementation. Therefore, a risk analysis is needed. This study aims to see what are the risk factors that may occur in the construction project of the Pejambuan Village Bridge, Sungai Tabuk District, Banjar Regency, South Kalimantan and determine what risks are most dominant.

Data collection was carried out by distributing questionnaires to 13 competent respondents. The data obtained was then tested for validity and reliability using the SPSS application. Furthermore, data analysis was carried out using the *Severity Index* calculation method, which was then plotted into *the Probability* and *Impact* Matrix in categorizing the risk variables and then included in the risk acceptance scale to obtain the dominant risk variables that occurred in the project.

The results of the research from the risk analysis on the implementation of the Pejambuan Village Bridge in Sungai Tabuk District, Banjar Regency, South Kalimantan are that there are 17 valid risk variables for the project. There were 16 dominant risk variables with the Medium category and 1 risk with *the High* category which had an effect on the project.

Keywords: Risk analysis, *Severity Index, Matrix Probability and Impact*, dominant risk variables.

1. INTRODUCTION

Construction activities have a major impact on the economy, so project management must be careful to avoid risks that can hinder its implementation. The construction project of the Pejambuan Village Bridge, Sungai Tabuk District, Banjar Regency, South Kalimantan, was carried out because the old 35-year-old bridge was damaged and dangerous. This new bridge makes it easier for residents to access Banjarbaru.

Every construction project faces risks, including the construction of a bridge in Pejambuan Village. The main obstacle is the mobilization of heavy equipment, because the road access is narrow and located on the side of the road which is a swamp land and residents' houses, so large trucks have to reverse to reach the location. This slows down

work, plus flood-prone areas affect time and cost. With this problem, it is necessary to handle and prevent risks correctly so that the project does not experience obstacles.

2. THEORITICAL STUDY

(Rumimper, 2015)According to Risk Management, it is an organized approach to identify potential risks in order to minimize the possibility of unexpected events. Risk Management is a structured method To make it easier for respondents to determine which risks are classified as probability and impacts from mild to very severe, a scale is needed as a benchmark. Respondents were given a questionnaire and filled in data according to the instructions. To measure the value of frequency/probability and also for the value of impact/impact, the author uses the Likert scale method. Frequency scale value/*probability* and impacts/*Impact* The risks that occur are obtained from the results of the questionnaire. Then continue by multiplying the scale on the column *probability* and scale columns *Impact*

According to (Wijaya, 2022)) Risk analysis is a systematic identification and evaluation process to determine, assess, and prioritize risks. Focus on key risks, limit losses, minimize damages, check for uncertainty, and clarify the role of each party in risk management.

Severity Index is to determine the value of probability and impact, and then categorize it based on the degree of probability of impact. The formula *Severity Index* (SI) in equation formula (1), namely:

$$\boldsymbol{SI = \frac{\sum_{i=1}^{5} ai.xi}{\sum_{i=1}^{5} xi}(100\%)} \quad \textbf{(1)}$$

Where:

ai = Assessment Constant

χi = Frequency of Respondents

i = 1,2,3,4,5

Table 1. Classification *Severity Index*

No.	Information	*Severity Index*
1	Very rare/very low (SJ/SR)	0,00 ≤ SI≤ 12,5
2	Rare/Low (J/R)	12.5 ≤ SI ≤ 37.5
3	Moderate/Medium (C/S)	37.5 ≤ SI ≤ 62.5

4	Frequently/High (S/T)	$62.5 \leq SI \leq 87$,
5	Very Frequently/Very High (SS/ST)	$87.5 \leq SI \leq 100$

(Hidayat, 2017)

The Probability Impact Matrix shows the level of risk that has been identified, with each risk assessed based on the probability of occurrence and its impact on the achievement of project objectives. It is then converted to *a Likert* scale to make it easier to analyze the risk

Rarely = 1

Infrequently = 2

Sometimes = 3

Often = 4

Very Often = 5

(Noferi, 2015)

The level of risk can be seen in the following equation (2):

$R = P \times I$ ..... **(2)**

Where:

R : Risk Level

P : Probability of risk

I: Impact of risks that occur

3. METHOD

In this study, first by searching for literature studies and conducting field observations so that several risk variables that may occur are obtained. After that, a questionnaire design was made.

Data collection uses *purposive sampling* techniques, namely from competent parties such as owners, contractors, consultants, and people inside and outside the project. The number of respondents in this study was carried out to 13 respondents. Then the data processing was continued with validity and reliability tests using the SPSS program

Risk Analysis uses the *Severity Index* method by estimating the frequency of a risk and its impact. then from the category based on the SI percentage value is changed to a likert scale of 1-5, then plotted into the *Matrix Probability* and *Impact* in categorizing the

risk variables, then included in the risk acceptance scale. To find out how to respond to a dominant risk, interviews were conducted with selected respondents.

4. RESULTS AND DISCUSSION

Based on the results of identification, as many as 20 risk variables were obtained.

Table 2. Risk Variables Used

Variable Code	Risk Variables	Source
P1	Government Policy	*Godfrey dkk, 1996*
P2	Damage to the surrounding environment	Field Observation
P3	Project locations affected by river flow	Field Observation
P4	Poor soil conditions	Field Observation
P5	Licensing Requirements	*Godfrey dkk, 1996*
P6	Increase in fuel oil prices	*Godfrey dkk, 1996*
P7	Increase in material prices	*Godfrey dkk, 1996*
P8	There is a delay in the payment of the down payment or term by the relevant agencies	*Godfrey dkk, 1996*
P9	Effects of the rainy season and bad weather	Field Observation
P10	Lack of availability of tools and materials to carry out the work	*Godfrey dkk, 1996*
P11	Difficulties in transporting heavy equipment to the project site	Field Observation
P12	Delays in the delivery of tools and materials	Field Observation
P13	Damage to work equipment	Field Observation
P14	Incompatibility of material use	*Godfrey dkk, 1996*
P15	Lack of competent workforce in the implementation of construction	*Godfrey dkk, 1996*
P16	Lack of thoroughness in work	*Godfrey dkk, 1996*
P17	Lack of teamwork	*Godfrey dkk, 1996*
P18	Security disruption at the project site	Field Observation
P19	Safety regulations that are not implemented	*Godfrey dkk, 1996*
P20	Work accidents during work in the field	*Godfrey dkk, 1996*

Validity Test and Reliability Test

Based on the results of the validity test of 17 existing statements declared "Valid", the "Invalid" statement was not included in the analysis.

Based on the results of *Cronbach's Alpha* = 0.920 for frequency and 0.932 for impact greater than 0.6, the questionnaire has a reliable level of reliability.

Risk Analysis

Table 3. Probability and Impact Assessment

	Probability			Impact		
Variable Code	**YES**	**Information**	**Scale**	**YES**	**Information**	**Scale**
A						
P2	43%	Enough	3	51%	Keep	3
P3	63%	Often	4	55%	Keep	3
P4	66%	Often	4	62%	Keep	3
B						
P5	37%	Infrequently	2	49%	Keep	3
C						
P6	58%	Enough	3	62%	Keep	3
P7	60%	Enough	3	69%	Tall	4
D						
P8	49%	Enough	3	54%	Keep	3
And						
P9	62%	Enough	3	68%	Tall	4
F						
P10	60%	Enough	3	54%	Keep	3
P11	54%	Enough	3	65%	Tall	4
G						
P12	63%	Often	4	71%	Tall	4
P13	49%	Enough	3	62%	Keep	3
H						
P15	48%	Enough	3	54%	Keep	3
P16	45%	Enough	3	60%	Keep	3
I						
P18	48%	Enough	3	45%	Keep	3
J						
P19	45%	Enough	3	38%	Keep	3
P20	54%	Enough	3	58%	Keep	3

Calculation of Risk Level Value

Calculate the value of the risk level by multiplication *Probability* (P) x *Impact* (I) from table 4.2. The assessment scale is as follows:(Rahmadian Ade, 2023)

Probability	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Impact				

Shoes	**Risk**

1-5	*Low*
6-12	*Medium*
15-25	*High*

Table 4. Results of Calculation of Risk Level Value with *Probability Impact Matrix*

Variable Code	Risk Level Value (P x I)	Category	Risk Acceptance Scale
A			
P2	9	*Medium*	Undesirable
P3	12	*Medium*	Undesirable
P4	12	*Medium*	Undesirable
B			
P5	6	*Medium*	Undesirable
C			
P6	9	*Medium*	Undesirable
P7	12	*Medium*	Undesirable
D			
P8	9	*Medium*	Undesirable
And			
P9	12	*Medium*	Undesirable
F			
P10	9	*Medium*	Undesirable
P11	12	*Medium*	Undesirable
G			
P12	16	*High*	Unacceptable
P13	9	*Medium*	*Undesirable*
H			
P15	9	*Medium*	Undesirable
P16	9	*Medium*	Undesirable
I			
P18	9	*Medium*	Undesirable
J			
P19	9	*Medium*	Undesirable
P20	9	*Medium*	Undesirable

Risk Response

The dominant risk is the risk factors in the *Unnacceptable* and *Undesirable* categories that will be interviewed to find out the cause of the risk.

Table 5. Risk Response

Code	Cause	Risk Response	Types of Breastfeeding
P2	In the field, researchers saw that galam was thrown into the river because the work had been completed.	Conducting socialization to the implementing party and coordinating supervision in the field so that it does not recur	*Risk Avoidance*
P3	River flows can cause erosion around the project site, river flows can also carry sedimentary material that can accumulate around the project site,	It is necessary to build a cantilever wall to protect the project area from flooding and erosion.	*Risk Reduction*
P4	The project location is soft soil.	Conduct geotechnical studies for and implement the results of geotechnical study recommendations.	*Risk Reduction*
P5	The process of obtaining permits often has quite long requirements and needs to be considered for permits from the surrounding community.	Prepare a thorough licensing plan, coordinate with local governments and involve the community.	*Risk Avoidance*
P6	Fuel prices are influenced by external factors such as fluctuations in world oil prices.	Use market information or fuel price analysis to predict future price increases	*Risk Reduction*
P7	Due to the increase in material prices that are not in accordance with the previous material price estimates	Have a trusted material distributor so that you can find out the increase in material prices	*Risk Reduction*
P8	Due to slow administrative procedures.	Make sure all documents are properly prepared	*Risk Avoidance*
P9	Indonesia has two seasons, the dry season and the rainy season.	Setting schedules to be more efficient by taking into account weather predictions.	*Risk Reduction*
P10	Lack of availability of tools and materials in the surrounding area that do not meet the needs in the field.	Ensure the availability of tools and materials in the surrounding area to ensure that it is sufficient for the needs in the field.	*Risk Avoidance*
P11	The road to the project site is difficult for heavy equipment to turn around due to narrow road conditions	Heavy equipment is required to walk backwards to reach the project site.	*Risk Retention*

Code	Cause	Risk Response	Types of Breastfeeding
P12	Poor weather and also uncertain shipping ship schedules	Check the ship schedule for delivery according to the desired schedule	*Risk Avoidance*
P13	Continuous use of the appliance without periodic maintenance	Perform regular checks daily before using the appliance.	*Risk Avoidance*
P15	Lack of proper and competency-appropriate training	Conducting training to develop the skills of workers	*Risk Reduction*
P16	Procrastinating on work and fatigue so that it causes a lack of thoroughness in work.	• Completing work according to the target so that it does not accumulate at the end • Ensure adequate rest to maintain performance.	• *Risk Avoidance* • *Risk Reduction*
P18	The number of people watching during the implementation of the project	Giving an appeal to the community	*Risk Reduction*
P19	Workers often neglect the use of K3 equipment	Provide regular training on the importance of K3 equipment	*Risk Avoidance*
P20	Lack of control of K-3 officers in the field against workers	Providing daily briefings related to K3 and required to use PPE	*Risk Reduction*

5. CONCLUSION

Based on the research and analysis that has been carried out, the following conclusions can be drawn:

1. It was found that 17 risk variables occurred in the implementation of the Pejambuan Village Bridge Construction Project in Sungai Tabuk District, Banjar Regency, South Kalimantan.
2. Risk variables/factors included in the dominant category are risk factors that have a *Medium* category with an undesirable risk acceptance scale of 16 variables and a *High* category with an unacceptable acceptance scale of 1 variable
3. Based on the risk response by means of *Risk Reduction* (reducing risk) to 8 risk variables, *Risk Avoidance* (Avoiding risks) to 8 risk variables, Risk *Retention* (Holding risks) to 1 risk variable.

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