Analysis of Risk Mitigation of Development of Flood Control Reservoir of Jadi Village Tuban District

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Abstract: Facing the flood problem is a homework from the Tuban Regency Government that must be completed in the near future, for that the Construction of the Village Flood Control Reservoir Jadi Tuban Regency is one of the efforts to answer the task, and can implement on time, a mitigation needed in an attempt to prevent project delays. This study uses the HOR method (House Of Risk) which is a framework consisting of HOR 1 and HOR 2 wherein this method steps taken by mapping the risk events with FMEA steps, looking for risk-causing agents, analyzing risk agents by determining the Aggregate Risk Potential (ARP), evaluates risk-causing agents with Pareto diagrams, and identifies proactive actions, and establishes priorities for handling / mitigating the causes of delays. In this research, the risks are 18 risk events, 67 agents are the cause of risk, and the highest priority is handling the determination of a qualified contractor in providing capital, materials, labor, and equipment as well as a contractor who has a solid work team and has the right implementation method and in accordance with Location and Weather, being able to overcome Project delays project delays

Keywords: HOR, Risk Event, Risk Agent, ARP, Mitigation, proactive action

1. Introduction

Tuban regency with the potential of substantial quarrying materials encourages the emergence of industries in the material processing sector of C-quarry mining, including Cement, currently more than 4 (four) Cement factories are established in Tuban Regency, along with the construction of large industries affecting the development of Tuban City, development cities leading to the west and south include Semanding, Tuban and Merakurak Districts, covering 4 (four) villages and 9 (nine) villages. In this area, there are long-standing residential blocks and new housing including Semen Tuban Housing. Besides that various infrastructures such as highways, markets, hospitals, shops, offices and various other buildings continue to increase in number[1][2].

In the western part of the city there is a knowing river or called Jambon four, according to the BAPPEDA study in Tuban District in collaboration with LPM ITS (2001) and the preparation of Tuban City drainage network master plan (2003) the area around Jambon four is a residential area with technical irrigation flow from Boto Dam and Winong Dam. This area is the most severely flooded every year, starting from 2001 until 2017[3][4][5].

according to Radar Bojonegoro, Friday, December 9, 2016, and reinforced by data from BPBD (Tuban District Disaster Management Agency that floods in the period of 2016 to 2017 have occurred 5 (five) times, namely [6][7]:

1. Afvour Jambon flood on February 23, 2016
2. Afvour Jambon flood on March 5, 2016
3. Afvour Jambon Flood on November 25, 2016
4. Afvour Jambon flood on December 9, 2016
5. Afvour Jambon flood on April 14, 2017

1.1. Formulation of the problem
Based on the description above, problems will arise:
1. How to determine risk events and their causes (agents) for delays in project implementation?
2. How to determine the linkages and priorities of risk events and their causes?
3. How to determine the priority of proactive steps in anticipating project delays?

1.2. Research objectives
Research objectives are as follows:
1. Determine risk factors and risk agents for project delays;
2. Determine the priority of risk factors and risk agents;
3. Determine the proactive steps to be taken by first determining priorities.

2. Literature Review

2.1. Project Management
In order to work on the construction of the Flood Control Reservoir to run well and according to expectations, it is necessary to have Project Management, considering that the notion of project management is a new science that discusses projects which are the development of conventional control which aims to regulate, manage limited resources[8][9][10] The main objectives of the project's goals and targets are to achieve performance or quality, cost and time. No matter how small the Project activities must be able to complete three triple constraints. Along with the development of the general definition era, Project management is the art and concrete action of desires through a series of deliberate efforts to achieve the desired results[11].

2.2. Control and Mitigation of Delay Risks in the Project
The implementation of a project to achieve the goals and targets of the project completes the three constraints in its journey or the life cycle of the project (life cycle) must encountered constraints/risks that arise. Risk Management is part of the project management process and always accompanies the project process[12][13] This process focuses on how risk management can applied in a project about who is involved and what procedures can be applied by first implementing mitigation according to (Act Law Number 24 of 2007) is a series of efforts to reduce disaster risk, both through physical development and awareness and capacity building to face disaster threats[14][15]. In the event of facing Project delays through steps:
- Risk Identification, Knowing who, What, how the causes of risk occur and knowing the frequency and risk control
- Risk analysis, looking for reasons and impacts
- Risk Evaluation, evaluating the results of risk analysis to determine the effect (severity) caused
- Determine the risks that will be faced;
- Determine the priority of the proactive steps to be taken.
3. Data Analysis and Discussion

3.1 Activity Mapping Stage
Mapping what activities are carried out during the construction of flood controllers starting from the Feasibility Study, Design Planning, Procurement, Construction Work, Hand Over processes.

3.2. Risk Identification Stage
In this stage, a risk register will be produced which contains:
1. What are the risks that occur (What)
2. Risk origin / where risk occurs (Where)
3. How do these risks arise/ be discovered (How)
4. Why does the risk appear (Why)
Where the dangers mentioned above have an impact on the project life cycle and affect the project completion time. From mapping the activities obtained by the type of work and looking for any risks that may occur (risk events) by assessing a scale of 1 to 5 to the severity (severity) of the risk that arises (Severity Level) / Impact of seriousness.

3.3. Linkage Analysis of Risk Events
The linkages between risk events need to be known for a better mitigation process. The distribution of questionnaires on the inter-risk ties only distributed to people who are competent in their fields, such as project managers, owners, or contractors. After obtaining a score for each relationship between risk events, then mapped into the correlation matrix of the relationship between risk events.

3.4 Risk Analysis Phase
Risk Analysis is a process to analyze qualitatively and quantitatively the impact of risk (severity) and the possibility of occurrence of risk (presence) of the project objectives that have set. The purpose of risk analysis is to sort out risks and separate them between risks that are dangerous and insignificant risks and create a risk map profile according to its rank. These results will be the basis for risk analysis and handling at a later stage. Impact (severity) and correlation (correlation) between risk events and risk agents, and the likelihood of these impacts occurring (occurrence) combined to determine the level/risk rating. This risk analysis process is carried out by analyzing the causes of the risks that have been identified and then calculating the Aggregate Risk Potential (ARP) value using the HOR1 Model. This ARP value obtained from the sum of the multiplication levels of severity with the occurrence level. The results of this risk analysis stage are risk priorities, and the classification of this ranking based on Pareto 80:20 which then used as a reference for the preparation of risk management plans.

3.5. Risk Evaluation Stage
The risk evaluation phase aims to produce a sequence of risk priorities to handled further risk mitigation. What do in this stage, which is comparing the Risk Profile with the Risk Evaluation Criteria previously set, and estimating whether a risk is acceptable or not, by the previous criteria, or considering the analysis of benefits and costs?

3.6 Risk Response Phase
The strategy design process is carried out using the second phase of the House of Risk (HOR) matrix to develop mitigation actions in dealing with risks that could potentially arise in the supply chain. HOR2 describes the steps at the strategy design stage, namely:
a. Choose some high-value risk agents  
b. Identify possible actions to prevent risk.  
c. Determine the correlation between each prevention action and each risk agent (Ejk).  
d. Calculate the Total Effectiveness of each activity.  
e. Assess the level of difficulty in carrying out each mitigation action using a Likert scale or another scale that describes the funds or other resources needed during the mitigation action.

In this study using the HOR method where the steps carried out are as follows:  
1. HOR 1 is used to determine which risk causes (Risk Agents) will given priority for actions to prevent delays  
2. HOR 2 determines which activity will be taken based on consideration of the costs and available resources

From the results of the research conducted on the Project for the Implementation of the Development of the Village Flood Control Reservoir, the District of Tuban obtained with the following results:  
1. Risk Events or risk events of 18 risk events  
2. Risk agents as 67 causes of risk  
3. From the ARP calculation results of ≥200 and the Pareto Diagram, 22 large Risk Agents were chosen to hinder the implementation of the Project,  
4. Priority Ranking Proactive steps towards potential risk agents are in table 1 as follows:

| No. | Proactive Steps                                                                 | Ranking the effectiveness of proactive steps | Description |
|-----|-------------------------------------------------------------------------------|---------------------------------------------|-------------|
| 1   | 2. Teamwork, the contractor, must be qualified in project management          | 3                                           | III         |
| 2   | The quality of the building must comply with the technical specifications     | XI                                          |             |
| 3   | Good coordination between the owner, consultant, and Contractor             | V                                           |             |
| 4   | Optimal planning and meticulous of planners consultant                       | VI                                          |             |
| 5   | The selection of the consultant for quality Planner                           | VII                                         |             |
| 6   | The selection of the contractors of quality in the provision of capital, material, and equipment | I                                           |             |
| 7   | Proper Planning survey with accurate data                                    | VIII                                        |             |
| 8   | The utilization of the available material around the location of the job     | X                                           |             |
| 9   | Incorporate environmental factors and sociological society in planning      | XII                                         |             |
| 10  | hold a renewal survey data                                                   | IV                                          |             |
| 11  | Teamwork Owner is a solid team and ably and integrate                       | IX                                          |             |
| 12  | The proper implementation of the method                                       | II                                          |             |
| No. | Proactive Steps                                                                 | Ranking the effectiveness of proactive steps | Description                                                                                           |
|-----|--------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------|
|     | and by the conditions of the pitch and the weather                              |                                              | Source: Processed Researchers                                                                        |

4. Conclusions
From the results of research conducted on the implementation of the construction of the flood control village so that the Tuban District using HOR application, the following conclusions were obtained:
1. Through the identification stage with the HOR I method captured Risk Events or risk events as many as 18 risk events with risk agents as many as 67 causes of risk;
2. From the ARP calculation results, and the Pareto Diagram is taken 22 risk agents with high potential to inhibit the implementation of the Project with ARP values above 200;
3. With the HOR Method 2, ranks 1 through 12 Priority Proactive Steps are obtained

From the results of the above conclusions, recommendations that we can convey so that this research is useful and as expected are:
1. In using this method the accuracy in data input is very influential, and if done manually, it should be done carefully and even better if there is already a calculation application.
2. The use of this method is very dependent on the type and model of the activity to be studied, should be adjusted to the conditions of work to be considered.

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