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Risk Based Improvement Performance Strategy for Operation and Maintenance Activities of River and River Infrastructure

(BBWS Ciliwung-Cisadane Authority)

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Abstract. The Ministry of Public Works and Public Housing (PUPR) has the duty and responsibility to carry out effective and efficient river operation activities and river infrastructure including overcoming floods during the rainy season, but these activities are deemed necessary for improvement in planning procedures. To realize this goal, it is necessary to manage risks that can reduce river performance and river infrastructure as flood control. With risk management in this activity, it is possible to apply the sequence of risks that occur which are then used as recommendations for action (risk response) and risk-based development strategies to improve river performance and river infrastructure to control floods through operation and maintenance activities to build a functional and sustainable system. Suitable for long-term planning and short-term maintenance needs.

Keywords: river, operation and maintenance, risk management.

1 Introduction

Apart from providing benefits to the community, the river also poses a threat to life, namely flooding, which is caused by the river that cannot receive flow and overflow into residential areas. Floods not only flooded residential area, but also damage community socio-economic service facilities, public infrastructure, and even casualties [1].

From various studies that have been carried out, the floods that hit vulnerable areas were caused by three things. First, human activities that cause spatial changes and have an impact on natural changes. Second, natural events such as very high rainfall, rising sea levels, storms, and so on. Third, environmental degradation such as vegetation cover in the catchment area, silting of the river due to sedimentation, narrowing of river channels. We can prevent floods through the operation and maintenance of river and river infrastructure [2]. However, this activity requires improvement in implementation procedures. One of them is by carrying out risk management which is prepared carefully and precisely so that it can be used to evaluate and measure the efficiency and effectiveness implementation operation and maintenance of river and river infrastructure [3].

Through literature studies, risk management has been identified as a method that can improve performance. The inequality of this study from previous research is that the operation and maintenance of river and river infrastructure have never been carried out by risk management, so it is not possible to determine the dominant risk that can reduce river performance and river infrastructure. This situation causes difficulties in efforts to improve the

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performance of river and river infrastructure. With the above considerations, this research will carry out risk management in river operation and maintenance activities and river infrastructure in the Balai Besar Wilayah Sungai Ciliwung-Cisadane authority to control floods.

2 Method

This study uses descriptive analysis with a combined method, namely a method that combines qualitative and quantitative approaches. Qualitative methods are used to obtain respondents' perceptions on the questionnaire in the form of words, from the Likert scale used. Quantitative methods are used to obtain scores from the results of respondents' perceptions of the questionnaire. The results of filling out the questionnaire were then analyzed using SPSS software. Figures from the results of the analysis are in the form of r count, Cronbach alpha, correlation coefficient, and regression coefficient. In connection with the respondent's perceptions in the form of words, then analyzed to produce numbers, this method is called a quantitative-qualitative approach [4].

2.1 Population and Sample

The population referred to in this study are experts and employees involved in the operations and maintenance of river and river infrastructure activities. The sample is part of the amount owed by the population. For the data to be normally distributed, the minimum sample is 30 people [5].

2.2 Data Collection

The research method is mostly based on secondary data that can be collected from several sources that have been responsible for the implementation and management of flood control in Balai Besar Wilayah Sungai Ciliwung-Cisadane's authority. For primary data, a field survey was conducted in the form of a questionnaire and interviews [6].

2.3 Data Analysis Techniques

Risk management in this activity starts from the identification of risk factors that occur in operations and maintenance activities which are raised from discussions and summaries by collecting information from several kinds of literature, books, journals, and internet media. The risk register will then be validated by an expert [7].

From the list of risk factors that affect the performance of river operation and maintenance activities and river infrastructure and have been validated by experts, then the frequency and impact will be measured using a Likert scale with 5 categories of assessment by respondents to get an overview of the scale of risk that occurs and will be useful later in determining priority control steps that should be taken. Measurement scale as below:

Table 1. Risk Frequency Scale [8]

Scale	Assessment	Information
1	Very Low	Almost never happened
2	Low	Rarely, only under certain conditions
3	Moderate	Sometimes it happens under certain conditions
4	High	Occurs under certain conditions
5	Very High	Often occurs in every condition

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Table 2. Risk Impact Scale [9]

Scale	Assessment	Information
1	Not Significant	Not too much influence on the performance of the river and river infrastructure
2	Light	Has little effect on the performance of the river and river infrastructure
3	Quite Significant	Quite an impact on the performance of the river and river infrastructure
4	Significant	Impacts on the performance of the river and river infrastructure
5	Very Significant	Very impact on the performance of the river and river infrastructure

From the risk matrix mapping above, a risk level can be made as below:

Table 3. Risk Level [9]

Symbol	Assessment	Information
H (High)	High Risk	Very influencing the performance of river and river infrastructure, it needs immediate treatment
M (Moderate)	Moderate Risk	Can affect on the performance of river and river infrastructure, it needs treatment
L (Low)	Low Risk	It has little effect on the performance of river and river infrastructure, so it is recommended to do treatment

To obtain risk categories and determine priority levels using the Analytical Hierarchy Process (AHP) method based on information from respondents regarding the frequency and severity of risks in operation and maintenance activities on river and river infrastructure performance. From the high and significant risk category, the impacts and causes will be analyzed in order to obtain a risk relationship on operation and maintenance river and river infrastructure activities. From the mapping of the risk matrix above [10].

3 Result and Discussion

3.1. Operations and Maintenance Activities of River and River Infrastructure

Operation and maintenance of river and river infrastructure activities are very important programs, considering that the implementation of the activities and their benefits directly touch the community as the beneficiaries. Operation and maintenance of river and river infrastructure activities are aimed at preserving the functions and benefits of the river for the community and life in general [11].

Operations of river infrastructure include three functions, namely regulation, allocation, and provision of water and river space. River infrastructure operations aim to optimize the benefits of the river and its infrastructure. Meanwhile, Maintenance of river and river infrastructure covers the function of maintenance and protection of the river and their infrastructure as well as

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water catchment areas which aim to support the smooth implementation and achievement of river infrastructure operational objectives [11]. The following is the organizational structure and tasks of implementing operation and maintenance of river and river infrastructure, as follows:

Fig 1. Organizational Structure for Operation and Maintenance of River and River Infrastructure

3.2 Risk Management

Risk management is a systematic and creative process for risk issues that includes risk identification, risk analysis, risk reduction, or assessment effectively and at the same time maximizing the achievement of the intended opportunities. Risk management is very important because it can prepare an organization to deal with certain conditions that cause harm to the organization [12].

The risks that may be faced in the operation and maintenance of river and river infrastructure can be tolerated based on risk categories. Risks that give rise to small hazards are usually ignored, while risks that give rise to big hazards tend to be avoided or a detailed strategy is prepared to overcome them, and the application of risk management will certainly make it easier to overcome risks and implement various policies and decisions of management to avoid risk or loss so that activities operation and maintenance of river and river infrastructure can be carried out effectively and efficiently. Seeing the relationship between risk management with operation and maintenance of river and river infrastructure described above, it is hoped that risk management in operation and maintenance can improve the performance of river and river infrastructure so that the objectives of this study are achieved [13].

3.3 Risk Identification in Operations and Maintenance Activities of River and River Infrastructure

The implementation of the operation and maintenance of river and river infrastructure is a process where plans/designs and specifications are implemented into an activity. This process involves the organization, the coordination of all resources such as manpower, equipment, materials, funds, time, technology, and methods to carry out activities on time and within budget and also the quality specified by the planner. If not handled properly, these problems will have an impact, one of which is flooding [14].

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To determine the risk factors in operation and maintenance activities that can reduce river performance and river infrastructure as flood control in this study, initial identification was carried out through literature studies, related documents, and some relevant research which were then processed by the researcher. This activity requires improvement in implementation procedures, so that risk factors are identified for business processes in operation and maintenance of river and river infrastructure activities from the planning stage to the implementation stage and existing resources [15]. Some of these factors are:

1) Labor factors refers to humans as workers who work in the operation and maintenance of river and river infrastructure.
2) Material factors refers to the raw materials used during the operation and maintenance of river and river infrastructure.
3) Equipment factors refers to work equipment, transportation equipment, telecommunication equipment as facilities/tools to support operation and maintenance of river and river infrastructure activities, both operational and non-operational.
4) Financial factors are the funds needed to finance business operations that are used to purchase materials, equipment, and pay employees.
5) Method Factors refers to methods, procedures, and managerial as a guide for the implementation of operation and maintenance of river and river infrastructure.

3.4 Operations and Maintenance Activities of River and River Infrastructure Performance

River and river infrastructure performance is an ability that is assessed qualitatively and quantitatively, which describes the function of a river and river infrastructure in terms of whether it can provide optimal functions or not, in this case, the function of the river and river infrastructure as part of flood control.

The indicators used to measure the organizational performance of the implementing unit in the operation and maintenance of river and river infrastructure are closely related to Organizational Capacity, namely how much resource capacity the operation and maintenance unit has. This factor has a lot to do with the input received/owned by the organization [11].

Performance indicators on operation and maintenance of river and river infrastructure activities based on the Organizational Capacity assessment elements include [11]:

- Availability of human resources
- Availability of OP Implementation Guidelines
- Map availability
- Availability of River Water Storage and River Flow Regulator
- Equipment availability
- Availability of Maintenance Equipment
- Availability of Monitoring Equipment
- Availability of Communication and Mobilization Equipment
- Delayed Routine Maintenance

4 Conclusion

The results of the research are in the form of risk categories that will be analyzed to determine the priority scale order of the risks that occur and determine the risk management

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which is then used as a risk-based development strategy in the form of action recommendations (risk response) to improve river and river infrastructure performance to control flooding through operational and maintenance activities to build a functional and sustainable system. suitable for long-term planning and short-term maintenance needs [7].

Risk management is an ongoing process. Every action taken from a risk analysis must take into account the impacts that occur, so taking steps that are taken only to transfer risks or new risks and in carrying out actions requires government firmness and consistency [12].

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