Audit Technical of Kori Rubber Dam in the River of Keyang District of Ponorogo East Java Province

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Audit Technical of Kori Rubber Dam in the River of Keyang District of Ponorogo East Java Province

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Abstract. The development of science and technology for the utilization and protection of rivers has embodied various types of river infrastructure. Without proper maintenance, rapid river sediments undergo physical degradation and function. Problems that occur in Kori Rubber Dam, among others, the damage to the body of the rubber dam that is made of rubber, so that the function of flower deflection is not optimal. This happens because of limited operational and maintenance activities (OM). A technical audit is a process of identifying problems, analyzing, and evaluating ones conducted independently, objectively and professionally on the basis of examination, to assess the truth, accuracy, credibility, and reliability of information about a job. In this case an assessment of the Kori Rubber Dam, which is basically a benchmarking activity. Assessment of rubber dam components includes the physical conditions and functions that affect the weir. This research is expected to know the performance of Kori rubber Dam as a recommendation material in the implementation of OM Rubber Dam activities.

1. Introduction
The rivers in Ponorogo Regency are generally still a natural river. However, some water infrastructure has been built in several rivers, one of them in the Keyang River. Several weirs have been built in the Keyang River, one of which is the Kori Rubber Dam in Sawoo District to irrigate rice fields with a standard area of 676 ha covering 17 Villages 4 District.

Kori Rubber Dam was built in 1993 by the Territory of Bengawan Solo River Region. Problems that occur on the Rubber Clump, among others, the damage to the body of the rubber dam, so that the blowing deflatedam function is not optimal. This is still the result of OM activities.

Kori rubber battle is used for irrigation weir and flood control. The length of the lower rubber weir respectively is 15.11 m, the length of the upper rubber weir is 17.67 m with maximum height when developed is 2.5 m, the slope of the retaining wall is 1: 0.3

Because of less optimal each component of Kori Rubber Dam resulted in sedimentation in upstream weirs. This resulted in reduced service and service life of the Kori Rubber Dam.
In general, the current problems are: inadequate and not even provided funds from the Regional Revenue Budget (APBD) for OM Rubber Dam activities, lack of OM staff in the field (in terms of quality & quantity), the priority of OM activities is still low.

This research is based on Regulation of PUPR No. 12/PRT/M/2015 and No. 23/PRT/M/2015. Rubber Dam Performance can be known by the assessment of the physical condition and function of the rubber dam components so as to know the performance of the rubber dam. Some of the problem formulation in this research are as follows: 1. How is the physical condition of Kori Rubber Climb in Keyang River; 2. What is the condition of the Kori Rubber Garden function in the Keyang River; 3. How does the Kori Rubber Garden performance in the Keyang River.

2. Experimental
2.1 Research sites
This research was conducted in Bendung Kori located in UPTD Sambit, Ponorogo Regency, East Java Province. Located about 200 km southwest of the provincial capital, and about 800 km east of the capital of the State of Indonesia. Ponorogo Regency is located at 111 ° 7' to 111 ° 52' East Longitude and 7 ° 49' to 8 ° 20' South Latitude.

The area of Ponorogo Regency is directly adjacent to Magetan Regency, Ponorogo Regency and Nganjuk Regency in the north. Regency of Tulungagung in the east and Regency of Trenggalek in the east. To the south with Pacitan Regency. While in the west is bordered by Pacitan regency and Wonogiri regency (Central Java province).
The total area of Ponorogo regency which reached 1,371.78 km2 is divided into 21 districts consisting of 307 villages.

2.2 Data collection
What is needed in this study include from primary data and secondary data.

1. Primary data
   a. Conducting site visits to Kori weir for observation of the physical condition of the existing weir directly in the field with an inventory of all the components of damaged buildings and still functioning.
   b. Direct interview with field officer at UPT Sambit of DPU of Ponorogo Regency to know Operation and Maintenance at Kori Rubber Dam

2. Secondary Data
   a. Data and reports from previous studies;
   b. Watershed maps with watershed boundaries, river basin patterns / schemes, settlements and concentrations of economic activities, boundaries of work areas between interpreters, other areas: working area of UPTD, working area of BBWS / BWS, and district area;
   c. The Infrastructure Network Scheme of the River depicting the location of the flooded river infrastructure, and each equipped and the names of other complementary building structures with nomenclature;
   d. Post-construction drawing (as built drawing);
   e. Planning 5 (five) annual management of river infrastructure;
   f. Documents and other supporting data.

2.3 Research Steps
The steps of this study include:
   a. Component Rating and Weighting
      Each major component is divided into several smaller components, each of which needs to be assessed for its condition. Each component will contribute the value of the condition to the overall physical condition of the rubber dam.
The contribution of each major component to the overall physical weir of rubber weighs is not the same. The weight of each component is prepared on the basis of the magnitude of the effect of each component on the assurance of irrigation water services.

The weight for each of the major components is a composite of each of its constituent components, and the weight distribution for both the main component and its constituent components. The distribution of the assessment of the main components of the rubber dam is adjusted to the sub component of the existing building on the rubber dam. From sub component of existing building each weight multiply by weight of component of building then divided by main weight. Thus the weight for each of the smallest sub-components can be known. Distribution of components and weights in the complete rubber dam.

b. Method of Assessment of Physical Condition and Condition of Rubber Dam Function
Approach and test model of condition assessment system and function of component component (facet) in determining priority order of rehabilitation of AHP-based rubber dam, as shown in Figure 1. Assessment Weight of Rubber Bend Asset Component is approximated by AHP Method. This AHP method is a method used in decision making of double-weighted parameters (OECD, 2008 and Saaty, 1990).

2.4 Assessment of Physical Condition of Rubber Dam
Asset component condition assessment system carried out three approaches with defects that are adjusted in the maintenance program. Approach system assessment of the condition of the rubber dam components. Based on PUPR No.12/PRT/M/2015 assessment percentage damage asset to four criteria right.

\[
NKBF_i = \sum_{i=1}^{n} W_k \times NKFi_n
\]

With:
- \(NKBF_i\) = Total Value Condition Rubber Dam
- \(W_k\) = The weight factor of the Rubber Dam component
- \(NKFi_n\) = value scale rubber dam conditions index component to the Rubber dam
- \(n\) = Components to 1,2,3, ...... etc

2.5 Assessment Condition of Function of Rubber Dam
Based on the Minister of Public Works Decree Number 23/PRT/M /2015 assess the percentage of functionality of the assets into four functioning criteria.

System assessment Functioning Component Rubber dam ability drain water to area. The value of the functioning of Rubber Dams come in to one's vision Synthesis Assessment compound functioning Rubber Dam Value of functioning compound Rubber dam press a man as following:

\[
NKBF_u = \sum_{i=1}^{n} W_f \times NKFu_n
\]

With:
- \(NKBF_u\) = Total Value Function Rubber Dam
- \(W_f\) = The weight factor of the Rubber dam component component
- \(NKFu_n\) = value index scale rubber dam component function
- \(n\) = Components to 1,2,3, ...... etc
2.6 Performance Rating of Rubber Dam
To know the performance of a building, keep in mind the physical condition and condition of the function of the building. After both conditions are known, then the next performance of the building can be known that is the sum of physical condition and condition of the function. Furthermore, based on the performance value, it can be found the recommended activity recommendations.

![Diagram of Condition Assessment System and Rubber Frame](image-url)

Figure 1. Approach Model of Condition Assessment System and Functioning of Rubber Frame Based on AHP-Based Rubber Component
3 Result and Discussion
The number of respondents is 46 (forty six) people. Targets of respondent questionnaire criteria of rubber weir weight are:

1. Practitioners in the field of water resources consisting of:
   a. Respondents from the Ponorogo District Public Works Office in charge;
   b. Respondent from Territory of Bengawan Solo River Region in charge;
   c. Respondents from HIPPA (Association of Water User Farmers).
2. Academic field of water resources consisting of the father of UNS Solo lecturer in charge.

Assessing the weight of each component of kori rubber dam is done by conducting questionnaires to practitioners and academics who know about the rubber dam component, is presented in Table 1.

| No | Sub component                  | Building Retrieval | Building Drain | Wing | Body weir | Other buildings and surroundings |
|----|--------------------------------|--------------------|---------------|------|-----------|---------------------------------|
| 1  | Doors Intake                   | 31%                | 13%           | 12%  | 37%       | 7%                              |
| 2  | Sediment / sludge              |                    | 4%            |      |           |                                 |
| 3  | Debit Measurers                |                    | 4%            |      |           |                                 |
| 4  | Exploitation Board             | 13%                | 10%           |      |           |                                 |
| 5  | Door drain                     |                    |               |      |           |                                 |
| 6  | Sediment / sludge              |                    | 3%            |      |           |                                 |
| 7  | Wing                           |                    |               | 9%   |           |                                 |
| 8  | Koperan / Embankment Cover     |                    |               | 3%   |           |                                 |
| 9  | Mercu / Rubber materials       |                    |               |      | 14%       |                                 |
| 10 | Floor weir (downstream floor / Olakan) |            |               |      | 9%        |                                 |
| 11 | Scale Board/Peil Schaal        |                    |               |      | 4%        |                                 |
| 12 | Foundation and Pillar          |                    |               |      | 10%       |                                 |
| 13 | Motor and Air Pump             |                    |               |      | 2%        |                                 |
| 14 | Installation Filling / Deflation|                    |               |      | 2%        |                                 |
| 15 | Bridge Crossings               |                    |               |      | 1%        |                                 |
| 16 | Security Fence                 |                    |               |      | 1%        |                                 |
| 17 | House Operation                |                    |               |      | 1%        |                                 |

3.1 Assessment of Physical Condition of Kori Rubber Dam
From the observation in the field, obtained the physical condition of kori rubber dam. Recapitalization of the physical condition of the Kori rubber dam is presented in the table. 2

3.2 Assessment Condition of Function of Kori Rubber Dam
Based on survey results in Kori Rubber can be known the value of the condition of the Kori Rubber dam function. The recapitulation of the Kori Rubber Dam function status is presented in Table.3

3.3 Performance Rating of Kori Rubber Dam
Based on the result of questionnaire of respondent about weighting about physical condition of dam with condition of dam function got result as follows: physical condition weir 29% and condition of dam function 71%. This shows that performance bendung more affected by the condition of the weir function. From Table 2. and Table 3 we get physical condition value and condition condition of Kori Rubber Dam as follows: physical condition value of kori rubber dam 81.79%, this indicates that the
small risk and the condition of kori rubber dams are in good physical condition (40). Condition value of kori rubber dye function 68.12%, this indicates that the small risk and condition of kori rubber dam in good condition in function (40). From the analysis of rubber weir performance obtained a value of 40, which means the rubber dam has a moderate risk with sufficient performance so that corrective maintenance is required.

Table 2. Recapitulation of the physical condition of the Kori rubber dam

| No. | Building                        | Physical Condition of Building | Value of Building Physical Condition |
|-----|--------------------------------|--------------------------------|-------------------------------------|
|     |                                | Good | Damage | Damaged | Heavy | Condition Value |
|     |                                | Lightly | Medium | Damage | Condition | Value |
|     |                                | >90 – 100% | >80 – 90% | >60 – 79% | <60% | |
|     | Damage level                  | Damage level | Damage level | Damage level |
|     | <10 %                         | 10 – 20 % | 21 – 40 % | >40% |
| 1   | Building Retrieval 31%        |      |        |        |        | 25.910% |
|     | Doors Intake 10%              | 80%  |        |        |        | 8.000%  |
|     | Sediment / sludge 4%          | 80%  |        |        |        | 3.200%  |
|     | Debit Measurers 4%            |      | 59%    |        |        | 2.360%  |
|     | Exploitation Board 13%        | 95%  |        |        |        | 12.350% |
| 2   | Building Drain 13%            |      |        |        |        | 10.400% |
|     | Door drain 10%                | 80%  |        |        |        | 8.0000% |
|     | Sediment / sludge 3%          | 80%  |        |        |        | 2.400%  |
| 3   | Wings of 12%                 |      |        |        |        | 9.750%  |
|     | Wing 9%                       | 80%  |        |        |        | 7.200%  |
|     | Koperan / Embankment Cover 3% | 85%  |        |        |        | 2.550%  |
| 4   | Body weir 37%                |      |        |        |        | 29.750% |
|     | Mercu / Rubber materials 14%  | 80%  |        |        |        | 11.200% |
|     | Floor weir (downstream floor/Olakan) 9% | 85% |        |        |        | 7.650%  |
|     | Scale Board/Peil Schaal 4%    |      | 55%    |        |        | 2.200%  |
|     | Foundation and Pillar 10%     | 87%  |        |        |        | 8.700%  |
| 5   | Other buildings and surroundings 7% |        |        |        |        | 5.940%  |
|     | Bridge Crossings 1%           | 88%  |        |        |        | 0.880%  |
|     | Motor and Air Pump 2%         | 89%  |        |        |        | 1.780%  |
|     | Installation Filling / Deflation 2% | 92% |        |        |        | 1.840%  |
|     | Security Fence 1%             | 91%  |        |        |        | 0.910%  |
|     | House Operation 1%            |      | 57%    |        |        | 0.570%  |
|     | Total Number                  |      |        |        |        | 81.790% |
Table. 3 Recapitulation of the condition of the Kori Rubber dam function the Kori Rubber Dam

| No | Building                                      | Building Function Condition | Value of Building Function Condition |
|----|-----------------------------------------------|-----------------------------|--------------------------------------|
|    |                                              | Excellent Functional Value  | Good Functional Value                | Medium Functional Value | Bad Functional Value |         |
|    |                                              | <90%                        | 70-90%                               | 55-69%                  | >55%                 |         |
| 1  | Building Retrieval 31%                       |                             |                                     |                        |                      | 24%     |
|    | Doors Intake 10%                             |                             | 90%                                 |                        |                      | 9%       |
|    | Exploitation Board 13%                       |                             | 80%                                 |                        |                      | 3%       |
|    | Building Drain 13%                           |                             | 90%                                 |                        |                      | 12%      |
| 2  | Building Drain 13%                           |                             |                                     |                        |                      | 6%       |
|    | Door drain 10%                               |                             | 60%                                 |                        |                      | 6%       |
| 3  | Wings of 12%                                 |                             |                                     |                        |                      | 7%       |
|    | Wing 9%                                      |                             | 60%                                 |                        |                      | 5%       |
|    | Koperan / Embankment Cover 3%                |                             | 56%                                 |                        |                      | 2%       |
| 4  | Mercu / Rubber materials 14%                 |                             |                                     |                        |                      | 25%      |
|    | Mercu / Rubber materials 14%                 |                             | 56%                                 |                        |                      | 8%       |
|    | Floor weir (downstream floor / Olakan) 9%    |                             | 60%                                 |                        |                      | 5%       |
|    | Scale Board/Peil Schaal 4%                   |                             | 60%                                 |                        |                      | 2%       |
|    | Foundation and Pillar 10%                    |                             | 95%                                 |                        |                      | 10%      |
| 5  | Other buildings and surroundings 7%          |                             |                                     |                        |                      | 6%       |
|    | Bridge Crossings 1%                          |                             | 85%                                 |                        |                      | 0.85%    |
|    | Motor and Air Pump 2%                        |                             | 85%                                 |                        |                      | 1.70%    |
|    | Installation Filling / Deflation 2%          |                             | 85%                                 |                        |                      | 1.70%    |
|    | Security Fence 1.0%                          |                             | 95%                                 |                        |                      | 0.95%    |
|    | House Operation 1.0%                         |                             | 80%                                 |                        |                      | 0.80%    |
|    |                                              |                             |                                     |                        |                      |          |
|    | **Total Number**                             |                             |                                     |                        |                      | 68.12%   |

4 Conclusion
Assessing the weight of each component of kori rubber dam is done by conducting questionnaires to Practitioners and academics who know about the rubber dam components. After the weights of each component of kori rubber dam can be assessed each component of kori rubber dam based on physical condition and condition of the function. The physical condition evaluation and the function of kori rubber dam is done by conducting survey or observation. After obtained the value of physical condition and condition of function Kori rubber dam will be obtained from the performance of kori rubber rubber. The performance of kori rubber dams is based on the sum of the physical condition and the value of the kori rubber dam condition.

Acknowledgment
This research is expected to know the performance of Kori rubber Dam as a recommendation material in the implementation of OM Rubber Dam activities.
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