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OPTIMIZING CANAL BLOCK DESIGN AS AN EFFORT TO REWETTING PEATLANDS IN PULANG PISAU DISTRICT

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ABSTRACT

Peatlands play an important role in the functioning of the hydrological system. However, unsustainable peatland utilization has led to a loss of hydrological function and increased fire risk in Pulang Pisau. This study aims to analyze the effectiveness of constructed canal blocks to determine the factors that cause problems in the block components as an effort to support peatland *rewetting* activities. The methods used included evaluating canal blocking based on construction documentation, *soft drawings* and analysis of climatic conditions. The results showed that the canal blocks were not optimal in maintaining the groundwater level ≤ 0.4 m from the surface of the peatland. This is due to internal factors (canal block design) and external factors (rainfall). This caused the block to be unable to effectively hold back the water flow, resulting in the canal block being submerged.

Keywords: Canal block evaluation, re-design, rewetting, peatland, Pulang Pisau.

1. INTRODUCTION

Peatlands are known as unique ecosystems that play an important role in the functioning of the hydrological system, as their ability to store water reserves can reach 13 times or around 100-1,300% of their dry weight. of its dry weight. In Indonesia, peatlands are spread across the islands of Sumatra, Kalimantan, Papua, and Sulawesi with a total estimated area of 13.43 million hectares. However, peatlands often face serious threats due to unsustainable peatland utilization, leading to problems such as degradation and deforestation. For example, in 2015, around 857,056 hectares of peatlands were burned, with the largest area of 336,689 hectares occurring in Central Kalimantan Province.

Pulang Pisau Regency, in Central Kalimantan Province, has been severely impacted by frequent forest and land fires, such as those that occurred in 2015, 2019, and 2023. These incidents have led to a decline in the ecological function of peatlands, loss of vegetation, and damage to the soil structure, resulting in a decrease in water storage capacity and a greater potential risk of further fires. To overcome this problem,

restoration efforts are carried out through rewetting techniques with the construction of a canal blocking as the primary in maintaining peatland moisture and regulating water management.

However, the implementation of canal blocking in the research location, Tanjung Taruna Village, faced technical challenges due to strong water currents and high rainfall, damaging the blocking components and local flooding. Therefore, it is important to evaluate the existing design to ensure the effectiveness of canal blocking in maintaining peatland moisture to support peatland rewetting activities in Pulang Pisau District.

2. THEORETICAL FOUNDATION

Peatland

Peatland is a unique type of swampland with a peat thickness of more than 50 cm and a water-saturated condition throughout the year. This land is formed from the accumulation of organic materials such as plant residues that occur over a long time (Sihite *et al*., 2013). Fires that occur in peatland areas are caused by two main factors, first natural factors such as El Nino, dry season, increased air temperature, and lightning, then the second human factors such as land clearing practices by burning, burning garbage, logging, and socio-economic conflicts (Anhar *et al*., 2022). Meanwhile, the impacts caused by post-fire include various aspects ranging from health aspects (respiratory problems, irritation), environmental aspects (ecosystem damage, loss of carbon sequestration function, greenhouse gas emissions), social aspects (land conflicts and responsibilities), economic aspects (loss of production and recovery costs), and political aspects (pressure from neighboring countries related to fire management and climate commitments) (Akbar & Faidil, 2010).

Restoration Process

Peatland restoration consists of four main stages. First, the planning stage includes data collection, determination of priority areas, and developing action plans based on location, type of intervention, implementation time, and budget. Second, the implementation stage is carried out using the 3R approach, namely *rewetting* (rewetting through the construction of canal blocks, canal filling, and boreholes), *revegetation* (replanting), and *revitalization* (empowering local communities). Third, the monitoring and reporting stage aims to evaluate the effectiveness of the restoration activities that

have been carried out and become the basis for improvement or maintenance. Finally, the evaluation stage is conducted to assess the success of restoration based on biophysical, biodiversity, hydrological, and socio-economic indicators (Rottie, 2019).

Types of Peatland Restoration

There are three approaches to peatland restoration that can be applied to restore degraded peat areas. The first is *rewetting*, which can be done by building canal blocks to keep the peatland moist so that it does not burn easily; the second is *revegetation*, which is done by planting degraded peatland areas with peat-friendly plants; and the third is *revitalization*, which is by empowering local communities to improve the welfare of communities living around peatlands welfare of communities living around peatlands (Yuliani & Rahman, 2018).

Peatland *Rewetting*

Rewetting is one of the methods of peatland restoration through *canal blocking* to restore the function of the Peat Hydrological Unit (KHG) as an ecosystem that can absorb and store water (Sari, 2010).

Canal blocking

Canal blocking is defined as a water structure used as a water barrier, built on the canal/ditch body the rate of water discharge and maintain or increase water storage in the canal body and also the surrounding area of the restored area (Dohong *et al*., 2017).

Climate Classification System

The climate classification that is still used and has been used in Indonesia is a classification system based on Oldeman's Theory. This classification system is based on the amount of water required by plants. The climate classification refers to Oldeman's Theory, where the degree of wetness of a month is divided into 3 categories (Nasution & Nuh, 2018).

1. Wet Month (BB): Months with CH>200 mm
2. Humid Month (BL): Months with 100 mm ≤CH≤200 mm
3. Dry Month (BK): Month with CH<100 mm

3. METODE

Research Location

The location of this research is in Tanjung Taruna Village, Jabiren Raya Subdistrict, Pulang Pisau Regency, precisely at the case study of canal block US-T1 / KSE 2L-P2. This block was built in an area not far from the Kahayan River and Sebangau River, KHG. This area is one of the priority targets for peatland restoration using the rewetting method implemented by BRGM RI.

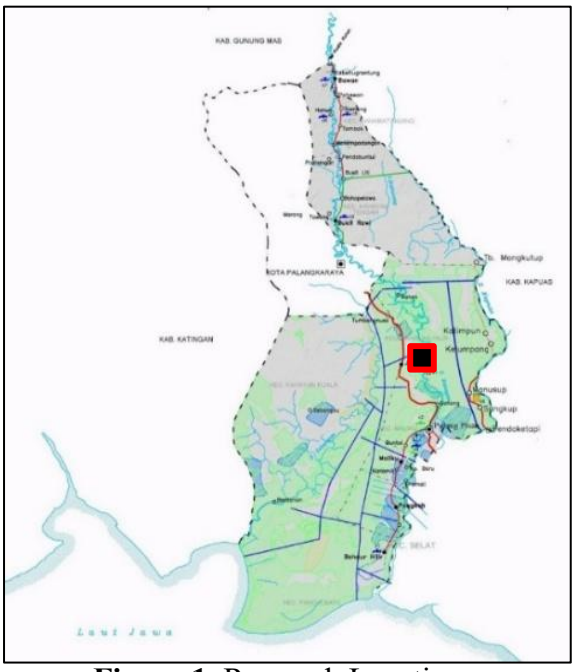

Figure 1. Research Location

Research Procedure

This research stage is carried out by preparing and collecting primary data in the form of canal bulkhead construction documentation and secondary data in the form of construction reference drawings (*soft drawings*) rainfall data and canal bulkhead coordinate data After all the data is obtained, the data is then analyzed to determine the effectiveness of the existing canal bulkhead design to determine the factors that cause damage to the canal bulkhead components.

4. RESULTS AND DISCUSSION

Evaluation of Canal Bulkheads Based on Development Documentation

Figure 2. Evaluation of canal bulkheads based on construction documentation

The evaluation of canal bulkheads based on construction documentation found that Overall, the work stages were carried out in accordance with the canal block construction procedure. However, problems were found in the wings and height of the bulkhead. of the bulkhead building. After the rain when the water began to rise, it was identified that there was a leakage flow that passed through the gap in the side of the wing. When the canal's discharge increased, the bulkhead submerged at the same height as the water surface. This resulted in a decrease in the effectiveness and strength of the bulkhead and caused the fill in the bulkhead to be eroded by the water current.

Canal Bulkhead Evaluation Based on *Soft Drawing*

In this study, an evaluation of canal bulkheads based on *soft drawings* was also conducted. The process involves reviewing the *soft drawing* and comparing it to the actual conditions in the field so that a conclusion can be drawn. Meanwhile, the results of the evaluation that have been carried out can be seen in Table 1.

Table 1. Evaluation Results Based on *Shop Drawing*

No.	Bulkhead Section Channel	Evaluation Description	Condition
1.	Canal Bulkhead Body	The main structure of the bulkhead can withstand the water flow well. The evaluation results show that the bulkhead body is not damaged.	Safe Condition
2.	Canal Bulkhead Wings	Wings' bulkhead experienced a break at the section connection to hard ground due to heavy flow after extreme rainfall.	Unsafe Condition
3.	Channel Bulkhead Height	The bulkhead height of 1.2 m is still in a flooded state, so it is necessary to optimize the height of the canal bulkhead building so that the bulkhead can function optimally. so that the bulkhead can function optimally.	Unsafe Condition
4.	Canal Bulkhead Runoff	Can maintain the TMA≥ of 0.4 meters and function well in draining excess water received by the bulkhead from upstream.	Safe Condition
5.	Canal Bulkhead Foundation	Using a 4m long and 2.8m deep galam pile driven into the hard soil layer. The bulkhead foundation is stable, and no settlement was found. No settlement was found.	Safe Condition

Climate Condition Analysis

Based on Oldeman's theory, it can be estimated that throughout 2024 Pulang Pisau Regency will experience wet months in January, February, March, April, July, October, November and December. In addition, Pulang Pisau Regency will experience humid months in May, June, August and September. There are no dry months in the district in 2024. Furthermore, based on the data trend for January to April 2025, Pulang Pisau Regency experienced three wet months, namely January, March and April. Then the humid month occurs again February. Meanwhile, in relation to the construction of the canal blocking, which began in October and continues until December, if we refer to the graph below, we can see that the construction of canal blocking in Pulang Pisau District will not occur again in 2025. 1. Rainfall Tran the canal block construction conditions coincided with the peak of the rainy season with high intensity reaching 447 mm - 523 mm.

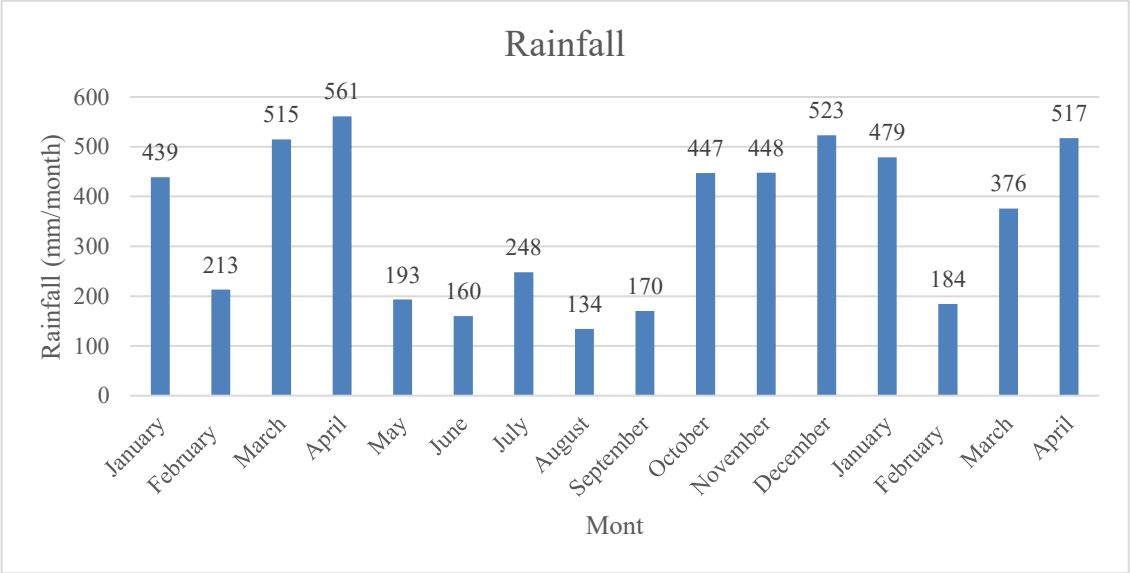

Chart 1. Rainfall Tran

5. CONCLUSION

Based on the research that has been conducted, it can be concluded that internal factors in the form of canal bulkhead design and external factors in the form of high rainfall cause the bulkhead to be submerged so that the rewetting process in Puulang Pisau District does not run optimally. Meanwhile, the damage to the bulkhead components, especially the wings and height of the bulkhead, can be concluded to be caused by the high intensity of rainfall that coincided with the time of canal bulkhead construction in Pulang Pisau District.

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