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Criticality Analysis of Recharge Area and Land in the Catchment Area of Musi Hydropower Bengkulu Indonesia

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Abstract

The aims of this study is to determine the criticality of recharge area and to assest criticality of land that occurred in the Musi hydropower catchment area. The criticality of recharge area had been analyzed by using geographic information system applications. Based on that application which covering the total catchment area of 60.369,97 ha of musi Hydropower catchment area, it has been shown that the condition of recharge area that still in good condition was 43.215,39 ha (71,58%), naturally normal condition was 6.857,31 ha (11,36), begin to critical was 2.560,28 ha (4,24%), rather critical was 5.506,40 ha (9,12%), and in critical condition was 2.230,58 ha (3, 69%). Assessment of the criticality of land was done by assessing the land cover factor, slope factor and the calculation of the erosion of Musi Hulu sub watershed land. The results of this assessment showed that the state of the land which in the state of not critical was 18.415,387 hectares (30,504%), potentially critical was 15.870,359 Ha (26,289%), rather critical was 18.073,017 hectares (29,937%), critical was 4.674,979 hectares (7,744%), and very critical was 443,170 ha (0,734%). From those analysis, it can be concluded that the recharge area and landof Musi hydropower catchment area is in the state of begin to critical.

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Keywords: Criticality of Recharge Area, Criticality of Land, Musi Hydropower Catchment Area, Musi Hulu Sub Watershed

1. Introduction

Musi Hulu sub-watershed had been functioned as a water catchment area for Hydroelectric Power Plant

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(HEPP) Musi. The existence of this hydropower has changed the flow direction of Musi Hulu river. The river was used to be flowed into Musi river and then emptied into the eastern coast of Sumatra Island. Nowaday, it is approximately 80% of Musi Hulu river heading its flow direction into Lemau river then it is emptied into the west coast of Sumatra.

The main problem for the Musi Hulu watershed is there so many forested area that had been converted for other uses such as farming plantation, settlements and others. Meanwhile, the main proponent of good or not the functionality of the watershed is the condition of forest area in the upstream of the Musi hydropower. Setianto et al (2007) stated that the deforestrated area at Bukit Daun Protected Forest had reached 66.64%. This also happened to Kerinci Sebelat National Park and Bukit Kaba Natural Tourism Park, where the total area that had been deforestrated in the region respectively is 14,08% and 49%. The forest conversion rate has caused the higher the degree of criticality of the water catchment areas and land criticality.

Deforestration that occured in the Musi Hulu sub watershed has caused a degradation of the forest area function, which then increased the number of critical lands. This is happened because the natural infiltration capacity of soil in that area has decreased. The bigger the damage of the forest, the more critical the land.

This problem must be taken into account seriously in order to take appropriate action in near future to save the Musi Hulu sub watershed. Therefore, it is necessary to do a study that aimed to examine the degree of criticality of recharge area and the criticality of land that occurred in that Musi hydropower catchment area. In this study, GIS (Geographic Information System) application will be used as a tool to determine the degree of catchtment area criticality and land criticality.

2. Methods

2.1. Research site

The research was conducted in the catchment area of Musi Hydro-Power Plant, lies on Rejang Lebong and Kepahiang Districts, Bengkulu Province, Indonesia. The site is at 102 ° 22'18 .98 "-102 ° 38'38 .93" Lat., And 3 ° 16'28 .873 "-3 ° 33'57 .441" long.

2.2. Collected Data

Primary data collected from the research site consisted of soil organic matter contents, soil structures, soil textures, and hydraulic conductivities.

Secondary data collected involved rain data in 10 years, topographical map, hydrological map, soil map, and land cover/land use map.

2.3. Data Analysis

2.3.1. Data Analysis for Regional Infiltration

Infiltration was determined by slope, soil type, amount of rain, and land cover. Those attributes were transformed to some values of potential infiltration, and levels of actual infiltration. Transformation values of the attributes followed *Planning Procedures for Forest and Land Rehabilitation Engineering Watershed* by Ministry of Forestry, Republic of Indonesia refer to P.32/MENHUT-II/2009. The process from identifying until determining recharge area conditition class is can be shown in Fig.1.

2.3.2. Data Analysis for Land Criticality