17-Criticality Level of The Land

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CRITICALITY LEVEL OF THE LAND IN PROTECTED FOREST AREA OF BARABAI CATHMENT AREA, BATANG ALAI SUB WATERSHED, HULU SUNGAI TENGAH REGENCY

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ABSTRACT

This researched aims to identify the characteristics of the protected forest area, analyze the criticality level of the land, and determine the direction of controlling the criticality level of the land in the protected forest area of the Barabai catchment area, which part of Batang Alai Sub Watershed, Hulu Sungai Tengah Regency. The method in determining the criticality level of the land uses scoring and weighting parameters for land cover, slope, erosion hazard level, and management.

The results obtained: 1) The characteristics of protected forest areas in the Barabai catchment area consist of: a) land cover classified as good on steep slopes, land cover classified as moderate on quite steep slopes, and classified as poor on flat slopes b) higher percentage of slopes the lower the criticality level of the land; c) the classification of the highest level of erosion hazard (medium category) is found at five sample points; d) The worse management efforts show the impact on the higher level of critical land; 2) At the research location in the protected forest area of the Barabai catchment area, the level of critical land variate from moderately critical to critical; 3) Efforts to control the criticality level of the land that can be carried out: 1) vegetatively through forest and land rehabilitation, groundwater recharge, and agroforestry; 2) technically through the construction of terraces and sewers; 3) policies through the land management of protected forest areas.

Keywords: critical land, criticality level of the land, catchment area.

INTRODUCTION

The condition of critical land in South Kalimantan Province, both inside and outside forest areas reach 511,594 hectares (Ministry of Environment and Forestry, 2018). The rate of forest destruction in South Kalimantan Province varies widely, one of which is indicated by the increase in the area of critical land, both inside and outside the forest area. Ecological land functions currently have increasingly limited quantity and quality. Land with a fixed amount but with increasing use, makes land that has limited capabilities still used (Wehrmann, 2011). The territory of Indonesia in general has an area of critical land that is always increasing every year. Such conditions occur because of the impact of the implementation of development that does not heed the principle of environmental balance and the lack of soil and water conservation efforts. Developments related to land development have so far been planned and implemented without being based on adequate information about the capability and suitability of land resources.

Critical land is generally caused by the exploitation of land that exceeds the capacity of the land, but naturally critical land is supported by unfavorable physical conditions of the area, such as high rainfall, steep slopes and soil conditions that are sensitive to erosion. The flood disaster that occurred in Hulu Sungai Tengah Regency, South Kalimantan Province, in mid-January 2021 is a clear example of a hydrometeorological disaster that is closely related to the condition of the watershed, especially the upstream part of which is designated as a forest

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area. Land cover degradation that occurs in forest areas, especially in protected forest areas is considered one of the factors supporting the occurrence of floods.

Based on the above, it is necessary to analyze the criticality level of land in the Barabai Watershed, especially in protected forest areas to determine appropriate control efforts in land use and restoration of environmental conditions.

Formulation of the problems

1. What are the characteristics of the forest area of the Upper Barabai Catchment Area, Hulu Sungai Tengah Regency with its designation?
2. What is the criticality level of the forest area of the Barabai Watershed Upstream, Hulu Sungai Tengah Regency at this time?
3. What policies will be taken and implemented in the context of flood control based on the results of the analysis of the criticality level of the land?

RESEARCH METHODS

This research is a combination of field surveys for ground checks and secondary data collection from related agencies. Field research was conducted to collect primary data, while institutional research was conducted to collect required secondary data.

Data Collection

Determination of the location of data sampling using purposive sampling technique, namely the sample point is determined intentionally. Sample points were taken based on soil type, slope class and land cover adjusted to land units from the land unit map (overlay). Each point will be observed for its biophysical parameters in the form of land cover type, soil conservation, slope and take soil samples for further observations in the form of soil solum depth, soil structure, soil texture, permeability and organic matter.

Data collection techniques by observing or observing directly in the field. The data collected is the criteria for determining the critical level of land in the field including land cover, slope, Erosion Hazard Level (TBE), and management.

Land cover

Land cover is assessed based on the percentage of tree canopy cover to the area of each land unit (the result of remote sensing image interpretation) and is classified into five classes. Each land cover class is then assigned a score for the purpose of determining critical land. In determining critical land, the land cover parameter has a weight of 50%, so the score for this parameter is the product of the score and its weight (score x 50).

Slope

The slope is the ratio between the height difference (vertical distance) of a land with its horizontal distance (Asdak, 2017). The magnitude of the slope can be expressed in several units, including % (percent) and ^{o} (degrees).

Erosion and Erosion Hazard Level

Prediction of erosion and the level of erosion hazard will be carried out using the Universal Soil Loss Equation (USLE) formula which takes into account the factors of rain, length, slope, soil, land cover and conservation measures. The USLE equation was proposed by Wischmeirer & Smith (1978). The erosion hazard level is obtained from the calculation of the erosion hazard class where the results of the erosion calculation are grouped and entered into the erosion hazard class table. The results of the analysis of the Erosion Hazard Class

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are related to the soil solum class, so that several classes of Erosion Hazard Levels are obtained as in Table 1 below.

Table 1. Erosion Hazard Class

Soil Solum (cm)	Erosion Hazard Class				
	I	II	III	IV	V
	Erosion (ton/ha/year)				
	< 15	15 - < 60	60 - <180	180– 480	> 480
	Erosion Hazard Level				
Deep (> 90)	0 – SR	I – R	II – S	III – B	IV– SB
Moderate (> 60 - 90)	I – R	II – S	III – B	IV – SB	IV– SB
Shallow (30 - 60)	II – S	III – S	IV – SB	IV – SB	IV– SB
Very Shallow (< 30)	III – B	IV – SB	IV – SB	IV – SB	IV– SB

Source: Ministry of Forestry (2009)

Remarks:
0 – SR = Very Light III – B = Severe
I – R = Light IV – SB = Very Severe
II – S = Moderate

Management

Management is one of the criteria used to assess critical land in protected forest areas, which is assessed based on the completeness of management aspects which include the existence of area boundaries, security and supervision as well as counseling.

RESULTS AND DISCUSSION

Characteristics of protected forest areas

The Ministry of Forestry of the Republic of Indonesia (2009), requires that there are several parameters or criteria in determining critical land in the Protected Forest area. These parameters are land cover, slope, erosion level, and management or management. In the assessment, each parameter is given a weight, magnitude and scoring. The total number of scores that have been multiplied by the weight of each parameter is the criticality class of each land.

Land Cover

Land cover classification for determining the criticality level of land is presented in Table 2.

Table 2. Land Cover Classification and Scoring of Critical Land

Kelas	Prosentase Tajuk	Penutupan	Skor	Skor x Bobot (50)
Very Good	>80%		5	150
Good	61–80%		4	200
Moderate	41–60%		3	150
Poor	20–40%		2	100
Very Poor	<20%		1	50

The results of the observations show that the land cover conditions in the field have three criteria for land cover found, namely good land cover, moderate to bad land cover as shown in Table 3.

Table 3. Land Cover

No	Sample Points	Land Cover	Percentage (%)	Class	Score	Weight (%)	Value
1	Land Unit 1	Forest	61-80	Good	4	50	200
2	Land Unit 2	Forest	61-80	Good	4	50	200
3	Land Unit 3	Forest	61-80	Good	4	50	200
4	Land Unit 4	Forest	61-80	Good	4	50	200
5	Land Unit 5	Forest	61-80	Good	4	50	200
6	Land Unit 6	Rubber Plant & Shrubs	20-40	Poor	2	50	100
7	Land Unit 7	Rubber Plant & Shrubs	20-40	Poor	2	50	100
8	Land Unit 8	Rubber Plant & Shrubs	20-40	Poor	2	50	100
9	Land Unit 9	Rubber Plant & Shrubs	20-40	Poor	2	50	100
10	Land Unit 10	Rubber Plant & Shrubs	20-40	Poor	2	50	100
11	Land Unit 11	Rubber Plant & Shrubs	20-40	Poor	2	50	100
12	Land Unit 12	Forest, Rubber Plant & Shrubs	41-60	Moderate	3	50	150
13	Land Unit 13	Forest, Rubber Plant & Shrubs	41-60	Moderate	3	50	150
14	Land Unit 14	Forest, Rubber Plant & Shrubs	41-60	Moderate	3	50	150
15	Land Unit 15	Forest, Rubber Plant & Shrubs	41-60	Moderate	3	50	150

In Table 3 can be seen that the land cover is 61-80% (good classification) on a 26-40% slope, 41-60% land cover (moderate classification) on a 15-25% slope, while 20-40% land cover (poor classification) on a slope of 8-15%, this is because on flatter to sloping land it allows easier community accessibility to carry out land change activities for agricultural activities.

Bukhari and Febryano (2008) suggest that traditional agricultural businesses that are carried out by converting forest land into agricultural land are often the cause of critical land. According to Holway and Burby (1993), land use that is carried out according to its designation can reduce the risk of flood natural disasters.

Slope

Slope classification for determining the criticality level of land is presented in Table 4.

Table 4. Slope Classification and Scoring for Criticality Level of the Land

Class	Slope (%)	Score
Flat	<8	5
Sloping	8– 15	4
Moderately	16– 25	3
Steep Steep	26– 40	2
Very Steep	>40	1

Source: BPDAS and Social Forestry (2013)

The results of field observations related to slope in determining the criticality level of the land show that there are three classes of slopes, namely gentle, slightly steep, and steep, which are presented in Table 5.

Table 5. The results of Scoring the Slope

No	Sample Points	Slope (%)	Class	Score	Weight (%)	Value
1	Land Unit 1	26-40%	Steep	2	20	40
2	Land Unit 2	26-40%	Steep	2	20	40
3	Land Unit 3	26-40%	Steep	2	20	40
4	Land Unit 4	26-40%	Steep	2	20	40
5	Land Unit 5	26-40%	Steep	2	20	40
6	Land Unit 6	8-15%	Sloping	4	20	80
7	Land Unit 7	8-15%	Sloping	4	20	80
8	Land Unit 8	8-15%	Sloping	4	20	80
9	Land Unit 9	8-15%	Sloping	4	20	80
10	Land Unit 10	8-15%	Sloping	4	20	80
11	Land Unit 11	16-25%	Moderately Steep	3	20	60
12	Land Unit 12	16-25%	Moderately Steep	3	20	60
13	Land Unit 13	16-25%	Moderately Steep	3	20	60
14	Land Unit 14	16-25%	Moderately Steep	3	20	60
15	Land Unit 15	16-25%	Moderately Steep	3	20	60

Table 5 shows that the higher the slope percentage, the lower the value of determining land criticality, so that in the protected area of the Barabai catchment area, the highest value is obtained at sample points 6-10 with a slope of 8-15%. This is in accordance with the statement of Asdak (2010), that the lower the slope percentage of the land unit, the higher the infiltration capacity, the lower the runoff and erosion and the lower the impact on the criticality level of the land.

Rayes (2007) suggests that the steepness of the slopes, the length of the slopes and the shape of the slopes can affect the amount of runoff, thus affecting the incidence of flooding in a catchment area. According to May and Lisle (2012), the upstream part of the watershed generally has steeper slopes which can accelerate runoff.

Erosion Hazard Level

The classification of erosion hazard levels for determining the criticality level of land is presented in Table 6. Erosion in a water catchment area is an event of moving or transporting soil or parts of land from one place to another by natural media, namely water or wind (Arsyad 1989). Furthermore, according to Yu et al. (2003) and Kadir (2013) stated that low infiltration capacity causes large erosion as a result of high surface runoff.

The results of calculations related to the level of erosion hazard in protected forest areas in the Barabai catchment area show 2 TBE classes, namely: 1) mild, and 2) moderate. In Table 6 it can be seen that the classification of the highest erosion hazard level (medium classification) is at sample points 1, 4, 5, 11, and 13. Arsyad (2010) states that overall there are factors that cause the magnitude of the erosion hazard, namely: climate factors, soil, vegetation, slopes, human activities and solum.

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Table 6. Determination of the Erosion Hazard Level and its Value

No	Sample Points	Type of Soil	Soil Solum	Erosion (ton/ha/yr)	Class	TBE	Score	Value (Weight=20)
1	LU 1	Clay Loam	Deep	68,27	III	II-S	3	60
2	LU 2	Clay Loam	Deep	45,33	II	I-R	4	80
3	LU 3	Clay	Deep	26,50	II	I-R	4	80
4	LU 4	Clay	Deep	63,25	III	II-S	3	60
5	LU 5	Sandy Loam	Moderate	19,67	II	II-S	3	60
6	LU 6	Clay Loam	Deep	18,32	II	I-R	4	80
7	LU 7	Clay Loam	Deep	44,36	II	I-R	4	80
8	LU 8	Sandy Loam	Deep	21,83	II	I-R	4	80
9	LU 9	Sandy Loam	Deep	32,65	II	I-R	4	80
10	LU 10	Sandy Clay Loam	Deep	21,22	II	I-R	4	80
11	LU 11	Silty Clay	Moderate	34,37	II	II-S	3	60
12	LU 12	Silty Clay	Deep	33,70	II	I-R	4	80
13	LU 13	Clay	Moderate	26,14	II	II-S	3	60
14	LU 14	Clay	Deep	41,49	II	I-R	4	80
15	LU 15	Clay	Deep	19,08	II	I-R	4	80

Remarks:
0 - SR = Very Light LU = Land Unit
I - R = Light
II - S = Moderate
III - B = Severe
IV- SB = Very Severe

Management

Manwan (1993) mentions that community-based management of critical land is a new approach for environmental researchers. In this community-based land management, the community is invited directly from planning. Furthermore, it is stated that land management can reduce the impact of changes to critical land.

Management classification for determining the criticality level of land is presented in Table 7.

Table 7. Management Classification and Scoring of Critical Land

Class	Completeness	Score	Score x Weight (10)
Good	Complete	5	50
Moderate	Incomplete	3	30
Poor	None	1	10

The results of observations and interviews with communities around the research area show that the research location has a moderate level of management, as shown in Table 8. Management of forest area in the Barabai catchment area at all sample point locations has a moderate classification as shown in Table 8, because incomplete management can affect the criticality level of land in a catchment area. The worse the management effort, the greater the impact on the criticality level of the land. Management efforts that can be assessed include the existence of regional boundaries, security and supervision and whether or not counseling is carried out.

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Table 8. Results of Management Scoring.

No	Sample Point	Weight (%)	Class	Completeness (%)	Score	Value
1	Land Unit 1	10	Moderate	Incomplete	3	30
2	Land Unit 2	10	Moderate	Incomplete	3	30
3	Land Unit 3	10	Moderate	Incomplete	3	30
4	Land Unit 4	10	Moderate	Incomplete	3	30
5	Land Unit 5	10	Moderate	Incomplete	3	30
6	Land Unit 6	10	Moderate	Incomplete	3	30
7	Land Unit 7	10	Moderate	Incomplete	3	30
8	Land Unit 8	10	Moderate	Incomplete	3	30
9	Land Unit 9	10	Moderate	Incomplete	3	30
10	Land Unit 10	10	Moderate	Incomplete	3	30
11	Land Unit 11	10	Moderate	Incomplete	3	30
12	Land Unit 12	10	Moderate	Incomplete	3	30
13	Land Unit 13	10	Moderate	Incomplete	3	30
14	Land Unit 14	10	Moderate	Incomplete	3	30
15	Land Unit 15	10	Moderate	Incomplete	3	30

Land Critical Level

The critical value of a land from each location point in the protected forest area is obtained from the sum of each parameter which has been multiplied by the weight of each parameter. The value of the land criticality level is presented in Table 9.

Table 9. Value of Land Critical Level

No	Sample Point	Value Factor				Total Value	Land Critical Level
		Landcover	Slope	Erosion	Mana-gement		
1	Land Unit 1	200	40	60	30	330	Rather Critical
2	Land Unit 2	200	40	80	30	350	Rather Critical
3	Land Unit 3	200	40	80	30	350	Rather Critical
4	Land Unit 4	200	40	60	30	330	Rather Critical
5	Land Unit 5	200	40	60	30	330	Rather Critical
6	Land Unit 6	100	80	80	30	290	Rather Critical
7	Land Unit 7	100	80	80	30	290	Rather Critical
8	Land Unit 8	100	80	80	30	290	Rather Critical
9	Land Unit 9	100	80	80	30	290	Rather Critical
10	Land Unit 10	100	80	80	30	290	Rather Critical
11	Land Unit 11	100	60	60	30	250	Critical
12	Land Unit 12	150	60	80	30	320	Rather Critical
13	Land Unit 13	150	60	60	30	300	Rather Critical
14	Land Unit 14	150	60	80	30	320	Rather Critical
15	Land Unit 15	150	60	80	30	320	Rather Critical

In Table 9, it can be seen that in the protected forest area of the Barabai catchment area, the criticality level of the land is somewhat critical and critical. Critical land in the study area is unproductive land, even though it is managed, its productivity is very low, this land has been damaged so that its function as a water regulator is reduced.

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The Minister of Forestry Regulation (2010) states that critical land is land located inside and outside forest areas that has been damaged, so that its function is lost or reduced to the specified or expected limit. Efforts to overcome critical land through forest and land rehabilitation are an effort to restore, maintain and improve forest and land functions so that their carrying capacity, productivity and role in supporting life support systems are maintained (Kadir et al, 2020).

Kadir (2014) stated that land with critical land criteria will be directed to use forestry plant species with forest land cover being maintained and maintenance or security improved with the community. Based on the criticality level of the land in the Barabai catchment, it is necessary to do several alternative efforts to reduce the criticality level of the land. In the context of controlling flood vulnerability, the following measures can be taken to control the criticality level of the land: 1) vegetatively through forest and land rehabilitation, groundwater recharge and agroforestry; 2) technically through the construction of terraces and sewers; 3) policies through the management of protected forest areas.

CONCLUSION

1. Characteristics of protected forest areas in the Barabai catchment area consist of: a) land cover classified as good on steep slopes, moderate classification land cover on moderately steep slopes, and poorly classified land cover on gentle slopes; b) the higher the slope percentage, the lower the criticality level of the land, the highest land criticality level is at sample point 6 to sample point 10 with gentle slopes; c) the classification of the highest erosion hazard level (medium category) is found at five sample points; d) The worse management effort shows the impact on the higher level of land criticality.
2. In the protected forest area of the Barabai DTA which is the research location for the criticality level of the land, the classification is somewhat critical to critical.
3. Directions for Forest and Land Rehabilitation based on the criticality level of the land, namely: 1) vegetatively through forest and land rehabilitation, groundwater recharge and agroforestry; 2) technically through the construction of terraces and drainage channels; and 3) by policy through the management of protected forest areas.

REFRENCES

[1] Arsyad, (1989). *Soil and Water Conservation,* First Edition. IPB Press. Bogor.

[2] Arsyad, (2010). *Soil and Water Conservation,* Second Edition. IPB Press. Bogor.

[3] Asdak, C. (2007). *Hydrology and Watershed Management*. Fourth Printing (revised). Gadjah Mada University Press.Yogyakarta.

[4] Asdak, C. (2010). *Hydrology and Watershed Management*. Fifth Printing (revised). Gadjah Mada University Press. Yogyakarta.

[5] Bukhari & Febryano, I.B. (2008). *Agroforestry Design on Critical Lands (Case Study in Indrapuri District, Aceh Besar District.* Perennial Journal, 6 (1) : 53-59.

[6] Ministry of Forestry RI. (2009). *Decree of the Minister of Forestry Number SK. 328/Menhut-II/2009, Concerning 108 Watersheds in Indonesia which are Prioritized for Handling*. Ministry of Forestry. Jakarta.

[7] Ministry of Forestry RI. (2009). *Regulation of the Minister of Forestry of the Republic of Indonesia Number P.32/Menhut-II/2009 concerning Procedures for Compiling Technical Plans for the Rehabilitation of Forest and Watershed Lands*.

Ministry of Forestry. Jakarta.

[8] Ministry of Forestry RI. (2009). *Regulation of the Minister of Forestry Number P.39/Menhut-II/2009 concerning Guidelines for Preparation of Watershed Management Plans*. Ministry of Forestry. Jakarta.

[9] Holway, J. M., & Burby, R. J. (1993). *Reducing Flood Losses Local Planning and Land Use Controls*. Journal of the American Planning Association. 59 (2): 205–216.

[10] Kadir, S., et. al., (2013). *Infiltration To Control Flood Vulnerability A Case Study of Rubber Plantation of Dayak Deah Community in Negara*, Academic Research International. Natural and Applied Sciences 4 (5):1-13. http://www.savap.org.pk.

[11] Kadir, S., (2014). *Watershed Management for Flood Control in Catchment Area Jaing Sub-watershed State of South Kalimantan Province. Postgraduate Dissertation.* Brawijaya University. Malang.

[12] Kadir, S., et. al., (2020). *A Study of Water Management for a Green Revolution in the Banyu Irang Sub-watershed, Maluka Watershed, South Kalimantan Province*, First Publicity May 2020. Publisher CV IRDH. ISBN: 978-623-7718-13-0. Malang

[13] Manwan, I. (1993). *Strategies and Operational Steps of Environmentally Insight Food Crops Research. Proceedings of the Food Crops Research Symposium III.*. Jakarta/Bogor August 23-25, 1993. P 65-97.

[14] May, C. L., & Lisle, T. E. (2012). *River Profile Controls on Channel Morphology, Debris Flow Disturbance, And The Spatial Extent of Salmonids In Steep Mountain Streams*. Journal of Geophysical Research Earth Surface.

[15] Rayes, M.L. (2007). *Land Resource Inventory Method*. Andi Publisher. Yogyakarta.

[16] Wehrmann, B. (2011). *Land Use Planning: Concept, Tools and Applications*. Land Policy and Management on behalf of Federal Ministry of Economic Cooperation and Development. GIZ Eschborn. Germany.

[17] Wischmeimer, W.H. & D.D Smith. (1978). *Predicting Rainfall Erosion Losses. A Guite To Conservation Planning,* US Departement of Agriculture Handbook No. 537, USDA, Washington, D.C.

[18] Yu, J., et. al. (2003). *Infiltratin and Erosion in Soils Treated With Dry Pam and Gypsum*. Soil Science Society of America Journal.67(2): 630-636.

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