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Land Use Evaluation on Entikong Border Area

Robby Irsan[1] Luthfi Muta'ali[2], Sudrajat[2], Nandi[3]
[1]Doctoral Program of Environmental Science, Gadjah Mada University,Yogyakarta, Indonesia
[2]Faculty of Geography, Gadjah Mada University, Yogyakarta, Indonesia
[3]Universitas Pendidikan Indonesia, Bandung, Indonesia

Abstract. Research on land use is very important, because land use has an influence on the physical environment as well as on the rules governing spatial planning. Various phenomenon of land use change happened from time to time. Changes in land use that occur in line with increased the number of people who directly impact on the need for increasing land. Entikong Sub district in Sanggau District is one of the areas directly adjacent to the state of Malaysia or Sarawak and is the first and the oldest cross-border entrance in Indonesia. Land use must be adjusted to the carrying capacity, because the land has limitations. Limitations can be seen from the ability of land, among others, land slope, soil type, rainfall, and lithology. The existence of land use interest is more dominant than carrying capacity, there can be land use that exceeds its ability. So the impact that occurred in the form of land and environmental degradation. The purpose of this study is to identify the type of land use and the carrying capacity of the Entikong border area to the land use change that occurred. The method of analysis used overlay method of land use map from two thousand eleven to two thousand seventeen, while the method of weighting or scoring to analyze the data by making a value to the existing circumstances. The results showed that the massive increased area from the mixed use years of two thousand seventeen plantation land increased by sixty point six percent of the Entikong area and degreased the primary forest variables by only eighteen point six percent of the Entikong area by years of two thousand seventeen. This is indicates that the protected forests are experiencing degaradation of land use change towards mixed gardens where in this mixed plantation there are oil palm, rubber and pepper. While the results of research related to the carrying capacity of Entikong border area where the analysis of soil type with Score one which means having very bad interpretation of land carrying capacity, rainfall analysis with Score four means having good interpretation of land carrying capacity, analysis of the scores with score four which means supporting the carrying capacity of the land, while lithology analysis with Score three where the interpretation is on the carrying capacity of the land. The average total of interpretation scoring of land carrying capacity indicates number sixty, which means Entikong border area has a moderate land carrying capacity which can be recommended for the development of integrated area but must be attention to several issues related by land physical factors and environmental sustainability in order to be sustainable.

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Correspondence : jurnalrobby@gmail.com

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A. INTRODUCTION

Entikong Sub-district in Sanggau District is one of the areas directly to the state of Malaysia (Sarawak) and the first oldest cross-border entrance in Indonesia. The current border region enters a new paradigm of regional development. As a region rising from globalization as well as policy decentralization, there has been a shift in the security paradigm towards prosperity (Modebadze, 2012 p. 13). Many different characteristics from other areas (production immobility, transaction costs, different economic systems, institutional issues, zoning, and the role of the informal sector) drive the region's economic functioning internally and externally (Muta'ali, 2015). Economic perspectives in the border region increased as the paradigm shifts. One indication it seen from land use that has undergone extensive changes and types of designation (Beek, 1978). Conversion of forest land into another land uses is a phenomenon occurring at the border of Entikong and has directly impacts such as air pollution, reduced biodiversity, and the decline of CO2 binders, especially in areas with abundant natural resources such as forests in Entikong (BPS, 2017).

The growth of border area residents has shown a significant rate of increase, as the pace of development investment, especially in the plantation sector. Based on the real condition, research will be conducted on land use problems, with emphasis on the analysis of changes in land conditions. Analysis studies in this study included land carrying capacity and scoring feasibility of land use related carrying capacity. The more dominant use of land use rather than the consideration of its carrying capacity, there may be land use that exceeds its capacity (Muta'ali, 2012). So the impact of land degradation is the decline of physical quality of land as a result of land use that is not accordanced with the physical condition of the land (Olive, 1998).

From these problems can cause the decline in land carrying capacity, raised the question of whether the land use change in Entikong border region in accordance with the carrying capacity of the land ?

This study describes the scoring of land carrying capacity feasibility so the unsuitable impacts of land use with land conditions can be controlled. The objectives of this research are to identify the extent and type and carrying capacity of land use in Entikong border area.

B. METHOD

Taking into account the background of the problem, the study of this problems are consideredable to provide an explanation of the results research is descriptive research. According to Nazir (2005), descriptive method is fact-finding with appropriate interpretation. In descriptive method the researcher can compare with certain phenomenon or study of theory (bibliography) so this research is a comparative study.

Related scoring in the assessment (Fandelli, 2000) in determining the assessment used the rating scale according that has been modified that is divided into 5 classes that is very bad, bad, moderate, good, and very good. The division of classes in this assessment is based on the divisions made by Fandeli, where are knowing by the state of the land carrying capacity component is divided into 5 classes. Interpretation of land carrying capacity against erosion sensitivity according to soil type, rainfall, slope class and appropriate by SK Menteri Pertanian No.837/ KPTSS/ Um/ 11/ 1980 and 683/ KPTSS/ Um/ 8/ 1981.

1. Data Collection Technique

Data collection done to obtain as input for the analysis phase.

Secondary data collection is done through literature review related to study problem. The information obtained will be used to support the problem / theme of the study raised and become the basic direction

for the implementation of the primary survey and the next stage of study.

2. Technical Analysis

Viewing the substance of the problem study "land carrying capacity", which is required data both qualitative and quantitative, the analytical method used a combined method of quantitative and qualitative.

Quantitative techniques are used to measure numerical data, while qualitative techniques are used to provided verbal explanations of information, images, schemes, in more depth related to the results of this study.

A. Overlay Methods

The process of remote sensing data analysis starts from geometric correction of image with topographic map scale 1: 25.000. Furthermore, land use is delineated manually by visual interpretation techniques. The characteristics of the objects depicted in the image are used to recognize objects called image interpretation (Sutanto, 1994). The elements of interpretation include hue, shape, texture, pattern, size, shadow, situ, and association. Interpretations combined with field observations are used to identify the types of land use described for primary forests, secondary forests, mixed gardens, rice fields, settlements, shrubs and water bodies.

The analysis of land use change is done by comparing land use map 2011 with land use map in 2017 (BIG, 2017). This is done to know land use change that happened in 2007 until 2017. Landsat and Earth Map interpretation results in 2007 and 2017 were then overlaid to produce land use change maps (Hamidy,2003).

B. Weighting Methods

Weighting method (scoring factor) is a technique in analyzing data by making a value against existing circumstances, and arranged according to rankings that have been made before. Variables to be assessed in accordance with predetermined variables are variables on land carrying capacity consisting of slopes of land; type of soil; rainfall; and aspects of lithology.

This assessment based on standard carrying capacity of the Entikong border area that adjusted to the physical condition of the land. So weighting yields the lowest value to the highest, between the values of 20-100 to determine which areas has high land holding capacity, moderate, and low. By determining the assessment which is used rating scale according to modified Fandeli that divided into 5 classes are very bad, bad, moderate, good, and very good. The division of classes in this assessment is based on the divisions made by Fandeli, which is knowing the state of the land carrying capacity component are divided into 5 classes.

C. RESULTS AND DISCUSSION

Analysis of Land Use Change in 2011 and 2017. Based on the interpretation results of landsat satellite imagery and google earth in 2007, 2011, and 2013 forest area has undergone a change of land use. Land use has shown both an increase and a decrease in land area. Massive land changes are on plantations where forest land is used by communities for oil palm, rubber and pepper plantations.

Table 1. Land Use Change for the Period of 2011 and 2017

Land Use	2011 (Ha)	2017 (Ha)	Change (Ha)
Primary Forest	17447,19	11787,32	- 5659,87
Secondary Forest	6445,43	5061,79	- 1383,64
Mixed Garden	35965,82	38396,63	+ 2430,81
Plant	878,68	1359,17	+ 480,49
Settlement	329,57	1558,59	+ 1229,02
Shrub	1824,42	5175,44	+ 3351,02

From the results of the analysis, the dominant land use in the border areas leads to mixed gardens where mixed garden types such as moor, fields, and rice fields.

Type of Soil Analysis.

Geological conditions Entikong District can be observed from the type of soil that is there. With the condition of the hills area can affect the type of land owned, namely land oraganosol, gley humus; red yellow podzolic ground. and complex land of FMD and lithosol.

Interpretation of carrying capacity of land according to the type of soil by SK minister of agriculture No.837/KPTSS/Um/11/1980 and 683/KPTSS/Um/8/1981.

Table 2. Interpretation of soil

Class	Type of soil	Sensitivity to erosion	Score	Interpretation
1	Aluvial, Grey, Planosol, Blue Hidromorf, Laterit	Not Sensitive	5	Very Good
2	Latosol	Rather Sensitive	4	Good
3	Chocolate Timberland, Chocolate Not Slender, Mediteran	Less Sensitive	3	Moderate
4	Andosol, Laterit, Grumosol, Podsol, Podsolik	Sensitive	2	Bad
5	Regosol, Litosol, Organosol, Renzina	Very Sensitive	1	Very Bad

Source : SK Minister of AgricultureNo.837/KPTSS/Um/11/1980

The analysis of the nature of the existing soil type in the Entikong region and the interpretation of the carrying capacity of the land is:

Table 3. Soil Analysis Result

Districts	Type of soil	Sensitivity	Score	Interpretation
Entikong	Oragonasol, Gley Humus; Podsolik ; litosol	Very Sensitive	1	Very Bad

Rainfall Analysis.

Rainfall affects the carrying capacity of the land that relates to soil conditions and erosion that will affect land use. High rainfall causes flooding and waterlogging for 2-5 hours, because in macro, this region belongs to Afaw climate grouping, the isothermal climate of tropical rain with a hot dry season with an average annual rainfall of 16.81 mm / hr of rain which includes low rainfall in Entikong sub-district.

Interpretation of carrying capacity of the land according to appropriate rainfall by SK Menteri Pertanian No.837/KPTSS/Um/11/1980 and 683/KPTSS/Um/8/1981.

Table 4.Interpretation Rainfall

Rain Intensity Class	Daily Rain Intensity (mm/ hr)	Description	Score	Interpretation
1	0 - 13,6	Very Low	5	Very Good
2	13,6 - 20,7	Low	4	Good
3	20,7 - 27,7	Moderate	3	Moderate
4	27,7 - 34,8	High	2	Bad
5	> 34,8	Very High	1	Very Bad

Source: SK Minister of Agriculture No.837/KPTSS/Um/11/1980

The analysis of rainfall in the Entikong region and the interpretation of the carrying capacity of the land is:

Table 5. Rainfall Analysis Result

District	Daily Rain Intensity (mm/hr)	Description	Score	Interpretation
Entikong	16,81	Low	4	Good

Slope Analysis.

Based on the geological map of the Entikong area and surrounding areas, the scale of 1: 50.000, Entikong City and its surroundings is generally located on a slope of 5% -15% slope including low to medium vulnerability ground movement zone. Land use change and slope cuts building infrastructure and other public facilities will result to stability slope (Zuidam, 1985).

Interpretation of carrying capacity of the land to appropriate rainfall by SK Menteri Pertanian No.837 /KPTSS /Um /11 /1980 dan 683 /KPTSS /Um / 8/ 1981.

Table 6. Interpretation of Slope

Slopes Class	Interval (%)	Description	Score	Interpretation
1	0 - 8	Flat	5	Very Good
2	8 - 15	Sloping	4	Good
3	15 - 25	More Steep	3	Moderate
4	25 - 45	Steep	2	Bad
5	> 45	Very Steep	1	Very Bad

Source: SK Minister of AgricultureNo.837/KPTSS/Um/11/1980

The analysis of existing slopes in the Entikong region and the interpretation of the carrying capacity of the land is :

Table 7. Slope Analysis Result

District	Slope Interval	Description	Score	Interpretation
Entikong	5-15%	Sloping	4	Good

Lithology Analysis

Based on geological map of Sanggau Regency scale 1: 250.000, research area composed by rock from young until old. This formation consists of sandstone, silt rock, mudstone, shale, generally gampingan. This formation is spread almost throughout Entikong area.

Interpretation of land carrying capacity according to lithology.

Table 8. Interpretation of Lithology

Lithology Class	Litology Parameters	Description	Score	Interpretation
1	Breksi Andesit	Very High	5	Very Good
2	Breksi Tuff	High	4	Good
3	Gamping Rock	Moderate	3	Moderate
4	Intrusi Andesit	Low	2	Bad
5	Mud Rock	Very Low	1	Very Bad

The lithology analysis in Entikong region and the interpretation of land carrying capacity is :

Table 9. Lithology Analysis Result

District	Litology Parameters	Description	Score	Interpretation
Entikong	Gamping Rock	Moderate	3	Moderate

Analysis Characteristic of Land

To know the impact of land use on land carrying capacity (Fandelli; 2000, p. 177), it must be known the value of the carrying capacity of the land divided into 3 classes of high, medium or low land carrying capacity for Entikong area. The results of analysis of carrying capacity of land use in Entikong border area more clearly can be seen in table as follows:

Table 10. Total Score of Supporting Land on Entikong

District	Type of soil	Value (a)	Slopes	Value (b)	Rainfall	Value (c)	Lithology	Value (d)	Total
Entikong	Litosol	1 (Bad)	5-15%	4 (good)	16,81 mm/hr hjn	4 (good)	Limestone	3 (moderate)	12

To determine the level of land carrying capacity, the highest value obtained from 4 variables valued multiplied by the highest score of 5 to get final value score of 20, while the lowest value obtained from 4 variables valuation multiplied the lowest score of 1, so it is resulting a value of 4. In order to have a score of 100 the resulting calculation as follows :

- The highest value is 20 : 20x100/20 = 100
- The lowest value is 4 : 4x100/20 = 20

From these results, if it want to be 3 levels of land carrying capacity then it must divided into several interval scores follows as:

- Low value of carrying capacity if, the total score is between 20 until 46 (20-46)
- Moderate value of carrying capacity if, the total score is between 47 until 73 (47-73)
- High value of carrying capacity if, the total score is between 74 until 100 (74-100)

Table 11. Final Table Level Supporting Area of Entikong

District	Calculation	Land Support Rate
Entikong	12 x 100/20 = 60	Moderate

The result of the calculation tell that the Entikong border area has a moderate land supporting capacity, so it can be used for various types of designation, and can be recommended further development direction, but considering the carrying capacity of moderate land, so the impact especially on the environment must be sustainable.

D. CONCLUSION

As one of the national strategic activity centers, Entikong requires more information and data related to the state of its own region. Data and information on the physical capacity of the land in supporting the development of the region, which is provided through mapping and investigation of the technical aspects of local geology. From the data and information obtained, and through further evaluation and analysis will sharpen the final information needed, for the planning to be made.

In the discussion that has been described, about the condition of the Entikong region and the surrounding areas. Favorable conditions can support the development and strengthening areas such as land carrying capacity of> 150 kg / cm2, at a depth of 1.8 - 4.0 meters from the local soil surface. Conversely, unfavorable conditions are expected to cause new problems in the future, including steep terrain. In this case, it is necessary to take preventive measures that can cope with these unfavorable conditions.

To cut the slope for the construction of infrastructure in the form of residential buildings/ office buildings and highways, it is necessary to calculate the stability of the slope, so the maximum height of the slope is quite stable at the time of slope cutting can be known. This is useful to avoid landslides.

It is necessary to make permanent surface drainage on the former landslide, which leads to the western tributaries in order to avoid the occurrence of water absorption process into the soil, to avoid it.

For land areas and hills formed by soil or rocks, which have diverse physical and engineering properties, in the planning of infrastructure development and high risk physical facilities, it is necessary to conduct geological investigation and investigate free groundwater availability as well as distressed groundwater.

The area located along the river channel within 50-100 m from the edge of the river channel, it is recommended used for green area (grennbelt) as a watershed conservation area (DAS) and not developed for designated residential areas.

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