INNSPUB

Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 13, No. 2, p. 367-372, 2018
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

Development of spatial data-based nature tourism in Bukit Batas, Tiwingan Village, Aranio District, Banjar Regency, South Kalimantan

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Article published on August 30, 2018

Key words: *Natural tourism, Data spatial, Bukit Batas, South Kalimantan.*

Abstract

Bukit Batas Nature Tourism (BBNT) is a natural conservation area that has a lot of potential, both flora, fauna and natural attractions that have a high natural value. Tourist attraction in Bukit Batas is very popular with tourists because the beautiful scenery can be enjoyed from the top of Bukit Batas or from all the way to the top. This study aims to analyze the objects and attractions of natural tourism in Bukit Batas with spatial data as a basic part of developing natural tourism development strategies. The method of assessing criteria and element criteria used by the Gunn & Var (2002) method is modified and pays attention to ADO-ODTWA (Dir PHKA, 2003b) adapted to resource conditions. The results of overlapping maps of all resource criteria are analyzed in order to obtain the suitability of regional resources for the development of natural tourism. Evaluation of the suitability of the area by using the Geographic Information System is one of several options for natural tourism planning based on spatial data at Bukit Batas. The results of the calculation of the value of spatial analysis, BBNT has a value between 2.51 to 3.25. Based on the suitability classification of the development of Nature Tourism, the BBNT region has 2 categories, namely the suitability of low intensity ecotourism (values between 1.76 to 2.50) and the suitability of moderate intensity ecotourism (values between 2.51 to 3.25). The location with suitability classification of low intensity ecotourism development is 24.4% tends to be collected in the central-western part of the BBNT region, while the highest percentage of suitability classification of ecotourism development is 75.6% (medium intensity tourism).

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Introduction

Bukit Batas Nature Tourism (BBNT) located in Tiwingan Village, Aranio District, Banjar Regency, South Kalimantan Province South Kalimantan has relatively good natural potential to be used as a tourist attraction. However, until now the management of natural tourism has not been carried out regularly by the community and local government. Natural tourism management is a form of regional service utilization by arranging the ability of biophysical potential and supporting resources. If this natural tourism is managed in a planned manner, it will increase the number of tourists who visit and have a good impact on the economic growth of the surrounding population as well as environmental sustainability.

One of the ways to analyze resources is to do a spatial analysis of overlapping models of maps with the criteria of each resource (Turk & Gumusay, 2003). The resource data mapping is obtained by scanning, digitizing and converting through several computer programs of geographic information system application programs. The results of overlapping map analysis of all resource criteria will obtain the suitability of regional resources for the development of natural tourism (Boers & Cottrell, 2005). Evaluation of regional suitability using Geographic Information Systems is the right choice for spatial tourism planning based on spatial data.

Materials and methods

Materials

The object of this research is Bukit Batas Nature Tourism in Tiwingan Village, Aranio District, Banjar Regency, South Kalimantan Province. Spatial data analysis requires a computer with ArcGIS software and aerial photography using a drone (quadcopter). Digital data is managed based on sources, themes, forms and criteria. Giving data attributes is done by ranking and weighting each digital map (Kusumoarto, 2006).

Methods

The method of assessing criteria and element criteria used by the Gunn & Var (2002) method is modified and pays attention to ADO-ODTWA (DirPHKA, 2003b) adapted to resource conditions.

The division of criteria elements is oriented to the interests of conservation and provides recreational value with satisfaction with visitors (Table 1).

Table 1. Spatial assumptions for geographic information system maps for resource criteria biophysical.

Elements of Criteria	Configuration	Rating	Quality
Habitat Sensitivity	Open field	4	22
	Secondary forest	3	
	Primary forest	2	
	Peat primary Forest	1	
Slope sensitivity	Flat - sloping	4	16
	Rather steep	3	
	Steep	2	
	Very steep	1	
Soil sensitivity	Not sensitive	4	8
	Less sensitive	3	
	Sensitive	2	
	Very sensitive	1	
Sensitivity to Rainfall	Very low	4	8
	Medium	3	
	High	2	
	Very high	1	
The attraction of natural phenomena	>2 natural phenomena	4	12
	1-2 natural phenomena	3	
The attraction of flora and fauna	More than one (1) species/endemic/ rare	4	16
	One species/ endemic/rare	3	
	Protected status	2	

Source: Gunn & Var (2002) and DirPHKA (2003a) (*modification*).

Data includes biophysical resources and supporting resources that are grouped into two categories, the main criteria and supporting criteria. The main criteria are criteria that are expected to be oriented towards conservation and also provide recreational value. Supporting criteria provide support for the interests of recreational value. To achieve the expectations of conservation efforts, the main criteria for biophysical resources are divided into elements of habitat sensitivity, slope sensitivity, soil type sensitivity and rainfall sensitivity based on the possibility of development which refers to conservation and the main criteria fauna which refers to recreational value. Supporting criteria are potential accessibility elements based on the possibility of development which refers to the value of recreation and the convenience of visitors.

Each element of the physical resource criteria is given a ranking based on the possibility of development that refers to conservation, namely 4 (insensitive), 3 (somewhat sensitive), 2 (sensitive), and 1 (very sensitive). Whereas the criteria for the potential attractiveness of natural phenomena, the potential attractiveness of flora and fauna as well as the criteria for ease of accessibility are ranked based on the possibility of development that refers to recreational values, namely 4 (high), 3 (enough), 2 (low), and 1 (very low). Each is given a different weight because each has different interests and impacts in natural tourism activities.

Results & discussion

1. Biophysical resource criteria

a. Habitat sensitivity

Habitat sensitivity is a consideration when entering wild life, especially animals being natural attractions. The ecosystem condition in the area is assumed to have a smaller abundance of wild life than the area covered by secondary or primary forests. BBNT includes the part of the Sultan Adam Forest Park area which is located at an altitude of 63 - 1,373 meters above sea level so that it is included in the tropical rain forest ecosystem type. BBNT is covered by forest vegetation, while open land lies in several roadside locations, BBNT is dominated by primary forest. BBNT land cover can be seen in Fig. 1. Weighting based on Gunn & Var (2002) in the development of spatial-based natural tourism. Based on spatial assumptions, the ranking of habitat sensitivity is presented in Table 2.

Tabel 2. Habitat sensitivity rating at BBNT.

Number	Configuration	Rating	Percentage (%)
1.	Open Land / Field	4	63,3
2.	Secondary forest	3	3,3
3.	Primary Forest	2	33,4
4.	Peat Forest	1	0,0
		Total	100,0

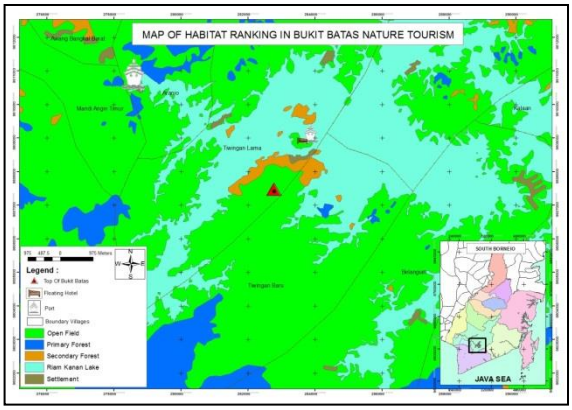

Fig. 1. Map of habitat ratings at BBNT.

b. Slope Sensitivity

The slope conditions from Pinus Island to BBNT vary from flat conditions (0 - 8%) to very steep (≥ 45%). The BBNT area is the lowest altitude hilly forest (valley) 63 mdpl and the highest hill is 1,373 masl. The slope rating in this study is in Table 3. and Fig. 2. BBNT ODTWA areas are dominated by the slope of flat-sloping slopes, and very steep slopes.

Table 3. Slope sensitivity rating at BBNT.

Number	Configuration	Rating	Percentage (%)
1.	Flat - sloping	4	36,1
2.	Rather steep	3	32,2
3.	Steep	2	28,4
4.	Very steep	1	3,3
Total			100,0

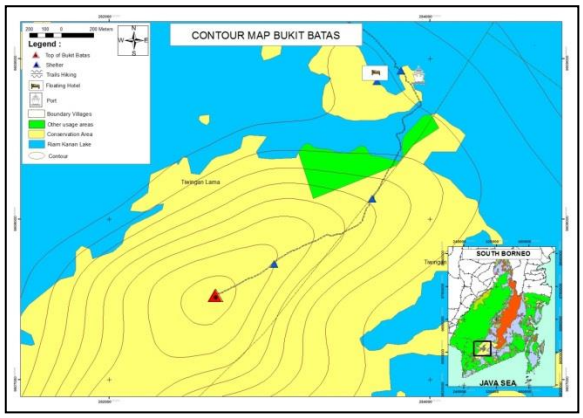

Fig. 2. Map of BBNT area contours.

c. Sensitivity Type of soil

Regarding the sensitivity classification of the type of soil used, it is important to adjust the classification of soil types used in this study. The area in BBNT is mostly litosol soil type followed by yellow and lateritic red podzolic (Hardjowigeno, 2003).

This is evidenced by a verification survey on the ground from dirt roads, river banks when crossing the road, land openings on roads that are thinly lined. The type of red yellow podzolic soil is a sensitive soil type or prone to erosion hazards, so that open cliffs will be very easy to experience landslides. This is important to be considered in the construction of natural tourism facilities and other facilities. Weighting-based weighting used by Gunn & Var (2002), gives a weight of 8 (eight).

d. Sensitivity to Rainfall

The rainfall approach in BBNT is obtained by interpolated processing data with the builder model extension. Data from the Meteorology and Geophysics Agency in 2016, shows that the average annual rainfall in BBNT is 1,150-2,000 mm / year while the average annual temperature is 20-35 ° C and the average annual humidity is 73-82%.

2. Supporting Criteria

According Roslita (2011), supporting criteria in this study are potential accessibility. Rank 4 is given for the location of objects with a distance between 0 and 4 km and the potential for easy access. Rank 3 for location of objects with a distance of more than 4 km and potential for easy access. Rank 2 for object locations with a distance of less than 4 km with heavy access potential. Rank 1 for location of objects with a distance of more than 4 km and potential for heavy access. BBNT as a whole is more than 4 km, with flat topography conditions up to very steep. So ranking in category 2 ranking, namely rank 4 (high) and rank 2 (low). The location with a slope of <25% (flat - rather steep), but the access range must pass the slope of> 25% (steep - very steep) then included in the category of heavy access. Ratings are presented in Table 4.

Table 4. Ranking of potential accessibility at BBNT.

Number	Configuration	Rating	Percentage (%)
1.	High	4	67,3
2.	Adequate	3	0,0
3.	Low	2	32,7
4.	Very low	1	0,0
Total			100,0

BBNT is dominated by areas with high accessibility potential (67.3%). Low access is around 32.7% located in the west of the area around BBNT. If supported by high potential can be an object of ecotourism that is of special interest. This has not yet become a reference because the process of determining the suitability of the development of natural tourism based on the results of the merger with the four elements of the criteria of natural resources above.

3. Spatial Analysis of BBNT Development Suitability

The next process is to do a compilation between the composite map results of the five elements of the criteria with each element of the criteria. Each element of the criteria influences the results of the suitability classification of tourism development. The sensitivity criteria for soil types give a uniform effect evenly throughout the BBNT area because this area has uniform soil types. Another criterion element besides the criteria for the sensitivity of soil types, has a different influence because it has variations in rank.

The entire area of insensitive habitat (open land) and rather sensitive habitat (secondary forest) is in the suitability category of medium intensity tourism development. Based on the slope of the slope, the whole flat - sloping and rather steep area is in the suitability category of medium intensity tourism development. All slopes are very steep and steep areas are in the suitability category of low intensity tourism development.

Areas with a potential for low and sufficient flora and fauna attractiveness as a whole are in the suitability category of medium intensity ecotourism development. This is due to the influence of other elements of the criteria because this area is a secondary forest and open land has a flat topography, sloping and a little bit steep. Based on accessibility potential, all areas with high accessibility potential are in the suitability category of medium intensity tourism development (Agung & Purwoko, 2010).

The results of the calculation of the value of spatial analysis, BBNT has a value between 2.51 to 3.25. Based on the classification of Table 5, the BBNT region has 2 categories, namely low intensity ecotourism suitability (values between 1.76 to 2.50) and moderate intensity of ecotourism (values between 2.51 to 3.25).

The location with suitability classification of low intensity ecotourism development is 24.4% tends to be collected in the central-western part of the BBNT region, while the highest percentage of suitability classification of ecotourism development is 75.6% (medium intensity tourism).

Table 5. Classification of suitability for BBNT development.

Number	Category	Percentage (%)
1.	Very low intensity / inappropriate tourism	0,0
2.	Low intensity tourism	24,4
3.	Medium intensity tourism	75,6
4.	High intensity tourism	0,0
Total		100,0

Based on the results of the compilation with each element of the criteria that the criteria built in this study are able to limit the development of spatial data-based ecotourism development in BBNT based on resource vulnerability for conservation purposes and still encourage the potential of ecotourism attraction to provide recreational value of natural tourism as a reference for agencies related in Banjar Regency. Based on this, the results of the classification can be the basis for planning the Bukit Batas Nature Tourism spatial plan.

Table 6. Results of overlaying resource criteria and results of spatial classification.

Criteria element		Tourism low intensity	Tourism medium intensity
		Percentage (%)	Percentage (%)
Habitat sensitivity	Not sensitive	0,0	0,6
	A little sensitive	0,0	7,6
	Sensitive	29.4	62.4
	Very sensitive	0,0	0,0
Total		29,4	70,6
Slope sensitivity	Not sensitive	0,0	36,1
	A little sensitive	0,0	32,2
	Sensitive	26,0	2,4
	Very sensitive	3,3	0,0
Total		29,3	70,7
Soil sensitivity	Not sensitive	0,0	0,0
	A little sensitive	0,0	0,0
	Sensitive	26,5	73,5
	Very sensitive	0,0	0,0
Total		26,5	73,5
Potential accessibility	High	0,0	67,3
	Adequate	0,0	0,0
	Low	24,1	8,6
	Very low	0,0	0,0
Total		24,1	75,9

Conclusion

The results of the calculation of the value of spatial analysis, BBNT has a value between 2.51 to 3.25. Based on the suitability classification of the development of Nature Tourism, the BBNT region has 2 categories, namely the suitability of low intensity ecotourism (values between 1.76 to 2.50) and the suitability of moderate intensity ecotourism (values between 2.51 to 3.25). The location with suitability classification of low intensity ecotourism development is 24.4% tends to be collected in the central-western part of the BBNT region, while the highest percentage of suitability classification of ecotourism development is 75.6% (medium intensity tourism).

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