Ecotourism Landscape Planning in Nature Tourism Park of Buyan – Tamblingan Lakes Tabanan and Buleleng Regency Bali Province

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Abstract. Nature Tourism Park of Buyan – Tamblingan Lakes is an area located in Tabanan and Buleleng Regencies, Bali Province. This area has various tourism potentials such as beautiful twin lake panoramas and pristine forest. Ecotourism is one form of sustainable tourism that pays attention to aspects of conservation, natural interpretation, and education. The purpose of this study is to plan an ecotourism landscape in the Nature Tourism Park of Buyan – Tamblingan Lakes. The benefit of this research is that the community knows the potential of the area and as a consideration for the government in local spatial planning. The analytical method used in this study is spatial analysis to determine land suitability for ecotourism and descriptive analysis to determine the perceptions of visitors regarding Nature Tourism Park of Buyan – Tamblingan Lakes. The results of this study are ecotourism landscape plans in the Nature Tourism Park of Buyan – Tamblingan Lakes which include spatial plans, circulation plans, vegetation plans, activity and facility plans, tour itineraries, carrying capacity plans, and landscape plans. The spatial plan consists of a entrance and service area covering 3.7 ha (0.20%), main tourism space covering 676.5 ha (37.62%), supporting tourism space covering 1.67 ha (0.09%), buffer space covering 549.1 ha (30.53%), and conservation space covering 568.4 ha (31.60%). The circulation plan consists of a primary circulation of 10,298 m, a secondary circulation of 1,614 m, and a tertiary circulation of 13,752 m. Tourism activities developed on the site are activities that are recreational and educational and there are natural conservation values. The concept of vegetation is divided into conservation vegetation, aesthetic vegetation, steering vegetation, and condensation vegetation. The tour itinerary was developed into three tour packages based on the time of tourist visit. Carrying capacity plans are made to limit the number of tourists to minimize damage to ecotourism areas, maintain the ecological value of the area, and avoid the accumulation of visitors.

Keywords: Ecotourism, landscape planning, Nature Tourism Park of Buyan – Tamblingan Lakes

1. Introduction

1.1 Background

Bali Province is one of the regions in Indonesia which has a diverse nature and culture. One example is Nature Tourism Park of Buyan – Tamblingan Lakes, which natural forests, steep lake cliffs, diversity of flora and fauna, and panorama of two lakes. In this area, there are already several tourist activities. However, the tourist area needs to be optimized and have to pay attention to the preservation of nature and social-cultural resources. Ecotourism is an alternative tourism concept that actively helps maintain the sustainable use of nature and culture. Therefore, Nature Tourism Park of Buyan – Tamblingan Lakes ecotourism landscape
planning that is integrated between tourist attractions, tourists, and area managers needs to be developed on the basis of nature and socio-cultural sustainability of the community to organize the area to be more functional and sustainable, aesthetic, organized well, forming regional tourism icons, as well as enhancing the welfare of the surrounding community.

1.2 Research Purposes
Purposes of this research are:
1. Identify and analyze the conditions, potential, and constraints that exist in the area of Nature Tourism Park of Buyan – Tamblingan Lakes for ecotourism planning;
2. Analyzing the types of nature tourism activities that can be developed in Nature Tourism Park of Buyan – Tamblingan Lakes;
3. Planning ecotourism landscape of Nature Tourism Park of Buyan – Tamblingan Lakes.

1.3 Methodology
1.3.1 Research location
The research was conducted at Nature Tourism Park of Buyan – Tamblingan Lakes, Tabanan and Buleleng Regencies, Bali Province (Figure 1).

1.3.2 Research Methods
1. Inventory
The inventory phase begins with the determination of site boundaries, and the collection of data and all related aspects information (physical, biophysical, social, legal aspects).
2. Analysis
Analysis was carried out on physical, biophysical, tourism, social and legal aspects by determining criteria on each aspect. Analysis on physical aspects includes topography, soil type, rainfall (scoring based on Minister of Agriculture Certificate’s Number 837/Kpts/Um/11/1980), land cover which consists of built area, fostered area and natural area [1], hydrology and climate. The level of landslide hazard is assessed based on the natural aspect of the slope according to Minister of Public Works Regulation Number 22/PRT/M/2007. Analysis of the biophysical component includes elements of vegetation and animals. The results of the analysis of each physical aspect produced 3 (three) categories of landscape sensitivity classes according to Minister of Agriculture’s Certificate Number 837/Kpts/Um/11/1980, namely low sensitivity class (<125), moderate sensitivity class (125-174), and high sensitivity class (>175). After assessing the sensitivity of the landscape, the values are then grouped into interval classes to determine the ecological zone of the region using the following formula:
High Vulnerability = \((S_{\text{min}} + 2CI + 1)\) to \((S_{\text{max}})\)

Medium Vulnerability = \((S_{\text{min}} + CI + 1)\) to \((S_{\text{min}} + 2CI)\)

Low Vulnerability = \((S_{\text{min}})\) to \((S_{\text{min}} + CI)\)

The results of the summing of landscape sensitivity scoring (overlay slope maps, soil type maps and rainfall maps) with land cover scoring are the ecological zones of the area which are then divided into three classes, namely low ecological zones (125-178.3), medium ecological zones (179.3-231.6), and high ecological zones (232.6-285). Analysis on the aspect of tourism using the Gunn (1989) method by analyzing the potential of attractions, visual conditions, accessibility and facilities. The results of this phase produce a composite map.

### 3. Synthesis

The synthesis process combines the results of the analysis, resulting block plan map that illustrates the level of land suitability for the tourist area.

### 4. Landscape Planning

At this phase, a landscape plan is made in the form of space, circulation, vegetation, activities and facilities, tourism programs and carrying capacity [2].

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DD = \frac{A}{S}
\]

DD = Carrying capacity

A = Area used by tourists

S = Individual average standard

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### 2. Results

#### 2.1 General Condition

Nature Tourism Park of Buyan – Tamblingan Lakes is located in a geographical position 8°14'11.37"S - 8°17'10.76"S and 115°05'18.22"E - 115°11'22.69"E, located at an altitude of 1162.5 - 2100 meters above sea level with a total area of 1 798.23 Ha. This area is included in seven villages, namely Pancasari Village, Wanagiri Village, Gobleg Village, Munduk Village, Pegayaman Village, Candikuning Village, and Batunya Village [3].

#### 2.2 Physical and Biophysical Aspects

##### 2.2.1 Topography and Slope

| Slope (%) | Characteristic     | Land area (Ha) | Percentage (%) |
|-----------|-------------------|----------------|----------------|
| 0-8       | Flat              | 931.85         | 51.8           |
| 8-15      | Sloping           | 291.32         | 16.2           |
| 15-25     | Slightly steep    | 215.15         | 11.9           |
| 25-40     | Steep             | 205.26         | 11.4           |
| >40       | Very steep        | 154.65         | 8.6            |
| **Total** |                   | **1 798.23**   | **100**        |

##### 2.2.2 Soil characteristic and type

The type of soil in Natural Tourism Park of Buyan – Tamblingan Lakes is regosol with gray and brown soil color. Regosol soil is included in very sensitive soil.
2.2.3 Hidrology
According to the BKSDA Bali (2017), Natural Tourism Park of Buyan – Tamblingan Lakes is an old caldera that contains rain water. Buyan and Tamblingan Lake do not have rivers, either as are infiltration areas, supply areas and water or hydro-orological protection areas.

2.2.4 Climate
Natural Tourism Park of Buyan Lake – Tamblingan Lake is included in A (Very Wet), with rainfall ranging from 2 000.72 mm per year. The temperature in the region ranges from 11.54°-20°C. Average of humidity air in the region is 91.98%, which indicates that the macro level is quite high [4].

2.2.5 Landscape sensitivity
Landscape sensitivity results from overlay of 3 maps, namely soil type sensitivity, rainfall intensity and slope which produce three landscape sensitivity classes, namely low landscape sensitivity of 910.4 ha (51.27%), medium area of 709.6 ha (39.96%) and high landscape sensitivity of 155.4 ha (8.75%).

2.2.6 Land Cover
The current condition of land cover is dominated by forest vegetation and there are two lakes separated by forest vegetation with varying topography. There are 3 types of landcovers in this region, namely built area of 1.07 ha (0.06%), fostered area of 210.49 ha (11.7%), and natural area of 1 586.67 ha (88.23%).

2.2.7 Ecological zones
Ecological zones are produced from overlapping maps of landscape sensitivity analysis with land cover maps which produce three ecological zones, namely low ecological zone of 922 ha (51.27%), medium ecological zone of 720.7 ha (40.08%), and high ecological zone of 155.4 ha (8.64%).

2.2.8 Vegetation and Animals
Some vegetations in the area are *Eucalyptus urophylla*, *Homalantus giganteus*, *Ficus benjamina*, *Tabernaemontana sphaerocarpa*, *Ficus glabella*, *Casuarina junghuniana*, *Dacrycarpus imbricatus*, *Erythrina lithosperma*, *Agathis dammara*, and *Bischofia javanica*. While, some animals in the area are *Macaca fasciculari*, *Muntiacus muntjak*, *Tupaia javanica*, *Ordo chiroptera*, *Eutropis multifasciata*, *Polypedates leucomystax*, *Megalaima armillaris*, *Prinia familiaris*, and *Oreochromis mossambicus*.

2.3 Tourism Aspects
2.3.1 Visual Quality
The natural physical condition of Natural Tourism Park of Buyan – Tamblingan Lakes has varied topography that can be a visual attraction (good view) at the location. Panorama of the twin lake landscape of Buyan and Tamblingan Lakes, as well as the undulating topography with natural forest areas around it can be used as an object for viewing. Bad visual quality (bad view) was also found at several points in this location, for example the presence of garbage heaps in this area.

2.3.2 Object and Attractions Potential
In general, the Natural Tourism Park of Buyan – Tamblingan Lakes has several potentials that can be an attraction to be developed into ecotourism areas including natural, cultural, and educational potential.
Table 2. Object and attractions potential in the area

| Object/attractions | Information |
|--------------------|-------------|
| Tropical forest    | This region is a mountainous tropical rain forest that is overgrown with various types of plants and high biodiversity value. This brings the potential for jungle tracking and mountain biking tourism. |
| Buyan Lake         | Buyan Lake has a beautiful natural landscape with a forest area around it, thus bringing up a variety of natural tourism potential around Buyan Lake namely camping, fishing, and photography. This lake has an area of around 466 ha (data processing results). |
| Tamblingan Lake    | Atmosphere, thus bringing up the potential of natural attractions such as canoeing, camping, fishing, and photography. This lake has an area of approximately 149.7 ha (data processing results). |
| Waterfall          | The waterfall in this region is adjacent to the Yeh Mampeh Temple, which is located in Kembang Merta. |
| Japan Cave         | In the area there are three Japan Cave that are still unexplored and have not yet been developed into tourist destinations. The Japanese cave is on the shores of Beratan Lake. |

2.4 Social Aspects

The questionnaire was distributed randomly to 40 respondents of the visitors. The lake is the most attractive natural tourist attraction according to respondents. Facilities that are needed to support ecotourism activities are seating, followed by view towers, safety fences, shelters, trash bins, toilets, camping facilities, security and cleanliness. While natural tourism activities that want to be developed according to respondents are enjoying the scenery, educational tourism, and walk around the area. Most respondents think that the local community who are actively involved in the management of the area are important for ecotourism activities. Based on the perception of area manager, this area still has constraints such as the problem of garbage in the area due to lack of awareness of visitors and there are still bird snare activities. Nature tourism activities are still limited. In addition, there is a need for improving management to infrastructure. Tourism management is carried out by BKSDA Bali and is adjoining the surrounding community.

2.5 Analysis

Composite map (analysis map) was obtained which resulted from overlaying the results of landscape sensitivity analysis namely slope, soil type, and rainfall, as well as tourism aspects which consist of potential objects and attractions, visual quality, accessibility, and facilities in the area. The next overlay is carried out with land cover and landslide hazard. The development of ecotourism is also considered from the legal aspect.

2.6 Synthesis

1. Zone with high level of suitability for tourism

   Physical and biophysical conditions supported tourism activities by good visual quality, potential tourist objects and attractions. This zone has an area of 1327.8 ha.

2. Zone with moderate level of suitability for tourism

   In this zone, physical and biophysical conditions are sufficient for ecotourism activities. This zone has an area of 311.2 ha.

3. Zone with low level of suitability for tourism

   Physical and biophysical conditions are less suitable for ecotourism activities. This area is used as a conservation area. This zone has an area of 148 ha.
2.7 Landscape Planning
Ecotourism landscape plans in Natural Tourism Park of Buyan – Tamblingan Lakes consist of spatial plans, facility and activity plans, circulation plans, vegetation plans, tourism plans, carrying capacity plans, and landscape plans.
2.7.1 Spatial, Activities, and Facilities Plans

Table 3. Division of space, activities, and facilities

| Space                        | Activities          | Facilities                                    | Space percentage |
|------------------------------|---------------------|-----------------------------------------------|------------------|
| Entrance and service area    | - Tourist entrance  | - Gate                                        | 0.20%            |
|                              | - Buy a ticket      | - Ticket counter                              |                  |
|                              | - Obtain regional   | - Information center                          |                  |
|                              | information activities and regulations | - Tourist attribute rental center |                  |
|                              | - Rental of tourist attributes | - Parking area |                  |
|                              | - Rest and eat      | - Toilet                                      |                  |
|                              | Shopping            | - Shelter                                     |                  |
|                              | - Walk around the area | - Food stall |                  |
|                              |                     | - Souvenir shop                               |                  |
| Main Tourism Space           | - Enjoy the view    | - Viewing point                               | 37.62%           |
|                              | - See the sun rise and set | - Selfie spot |                  |
|                              | - Selfie tour       | - Camping ground                              |                  |
|                              | - Camping           | - Photographical spot                         |                  |
|                              | - Photography       | - Canoe and deck                              |                  |
|                              | - Fishing           | - Jungle track                                |                  |
|                              | - Tracking          | - Mountain bikes                              |                  |
|                              | - Mountain biking   | - Outbound facilities                        |                  |
|                              | - Outbound          | - Viewing deck                                |                  |
|                              | - Birdwatching      | - Interpretation board                        |                  |
|                              | - Nature interpretation | - Shelter |                  |
|                              |                     | - Trash can                                   |                  |
| Supporting tourism space     | - Enjoy the view    | - Viewing point                               | 0.09%            |
|                              | - Vegetation and animals species observation | - Observation point |                  |
|                              | - Photography       | - Interpretation board                        |                  |
|                              | - Picnic            | - Photographical spot                         |                  |
| Buffer space                 | - Enjoy the view    | - Viewing point                               | 30.53%           |
|                              | - Vegetation and animals species observation | - Observation point |                  |
|                              | - Photography       | - Interpretation board                        |                  |
|                              | - Sitting around    | - Photographical spot                         |                  |
| Conservation space           | - Area management   | - Viewing point                               | 31.60%           |
|                              | - Observation       | - Interpretation board                        |                  |

2.7.2 Circulation Plans

The circulation plan in the area consists of primary circulation, secondary circulation and tertiary circulation.

Table 4. Circulation plans in the area

| Circulation | Users                          | Length (m) | Width (m) | Material          | Placement                      |
|-------------|--------------------------------|------------|-----------|-------------------|--------------------------------|
| Primary     | Car and motorcycle             | 10 298     | 4-10      | Asphalt           | Entrance and service area      |
| Secondary   | Pedestrian, bicycles, motorbikes | 1 614     | 1-3       | Paving on some lines | Main tourism space and supporting tourism space |
| Tertiary    | Pedestrians                    | 13 752     | 1         | -                 | Main tourism space and buffer space |
2.7.3 Vegetation Plans
The vegetation plan in the Natural Tourism Park of Buyan - Tamblingan Lakes is directed to fulfill the conservation, condescendent, aesthetics, and steering functions.
1. Conservation Vegetation
   This vegetation has a function to conserve soil, water and reduce the impact of erosion, one of which is *Calliandra calothyrsus*, *Leucaena leucocephala*, and *Tectona grandis*.
2. Condescendent Vegetation
   This vegetation is used to modify the microclimate in the region. The planned vegetation is *Swietenia mahagoni*, *Pterocarpus indicus*, and *Samanea saman*.
3. Aesthetics Vegetation
   Aesthetic vegetation functions as a space maker, space divider, as a marker and provides a theme at a location. The type of vegetation used is *Calliandra calothyrsus*, *Syzigium campanulantum*, and *Delonix regia*.
4. Steering Vegetation
   Steering vegetation serves to direct the circulation of vehicles, pedestrians, and cyclists. The planned vegetation is *Albizia chinensis*, *Mimusops elengi*, and *Acacia mangium*.

2.7.4 Tourism Itinerary
The ecotourism packages is made based on the duration of the tour visit time which is a short and moderate tour visit.

Table 5. Tourism packages

| Package | Activities                  | Tourism Object                  | Visit Time |
|---------|-----------------------------|---------------------------------|------------|
| A       | 1. Selfie tourism           | 1. Two lakes panorama           | 1 day      |
|         | 2. Birdwatching             | 2. Natural forest view           |            |
|         | 3. Bencingah tracking       | 3. Vegetation and animals (birds)|            |
|         | 4. Shopping                 | 4. Ulun Danu Tamblingan Temple  |            |
| B       | 1. Selfie tourism           | 1. Two lakes panorama           | 2 days     |
|         | 2. Birdwatching             | 2. Natural forest view           |            |
|         | 3. Camping in Buyan         | 3. Buyan Lake                   |            |
|         | Camping Ground              | 4. Tamblingan Lake              |            |
|         | 4. Buyan – Tamblingan       | 5. Vegetation and animals (birds)|            |
|         | Tracking                    | 6. Several temples in the area  |            |
|         | 5. Shopping                 |                                 |            |
| C       | 1. Selfie tourism           | 1. Twin lake panorama           | 2 days     |
|         | 2. Birdwatching             | 2. Natural forest view           |            |
|         | 3. Camping in Tamblingan    | 3. Tamblingan Lake              |            |
|         | Camping Ground              | 4. Vegetation and animals (birds)|            |
|         | 4. Tamblingan tracking and  | 5. Several temples in the area  |            |
|         | canoeing                    |                                 |            |
|         | 5. Outbound                 |                                 |            |
|         | 6. Shopping                 |                                 |            |

2.7.5 Carrying Capacity Plan
Based on calculations with formulas and determination of carrying capacity standards [4], carrying capacity for tourist space in the region is 2 052 tourists where the carrying capacity for the main tourist space is 1 886 tourists, carrying capacity for supporting tourism is 166 tourists, carrying capacity for entrance and service space is 667 tourists, carrying capacity for buffer space is 10 tourists, and carrying capacity for conservation space is 5 tourists.
2.7.6 Landscape Plan
Landscape plans are considered based on physical aspects, biophysical aspects, tourism aspects, and social aspects as well as considerations from the legal aspects, so as to produce spatial plans, circulation plans, vegetation plans, activity plans, facility plans, travel plans to be developed, and carrying capacity plans region.

3. Conclusion
The ecotourism landscape planning in the Natural Tourism Park of Buyan – Tamblingan Lakes consists of spatial, circulation, vegetation, activities, facilities, and carrying capacity. This planning is done to develop the potential and overcome obstacles such as landslides, garbage, lack of tourist facilities, and so on. The developed area is 1 798.23 ha, with entrance and service area, main tourist, supporting tourist area, buffer space, and conservation space. The area circulation is divided into three, namely the primary, secondary, and tertiary circulation. Existing tourism activities are jungle tracking, mountain biking, camping, fishing, photography, and canoeing. Tourism activities developed at the site are recreational and educational activities based on the potentials in the region namely natural, cultural, and educational potential. The concept of vegetation is divided into conservation vegetation, aesthetic vegetation, steering vegetation, and condescendent vegetation. Facilities developed in the area are adjusted to planned activities in the tourist area. The tour itinerary was developed into three tour packages based on the time of tourist visit. The carrying capacity plan is made to limit the number of tourists.
4. References

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