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# **MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA**

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## **ABSTRACT**

Nusa Penida Island is one of the famous island in Bali Province has a big potential for eco-tourism development according to the data of foreign tourists visiting Nusa Penida district which is about more than 200,000 people per year. The study was conducted to assess the potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was assessed by calculating the tourist suitability index and carrying capacity of mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs in second quadrant. Some strategies of eco-tourism development in this mangrove forest are cooperating with all related stakeholders, inviting investors, improving types of tourist services such as improving all supporting facilities for eco-tourism activities, increasing the number of tourist attractions, designing plans and regulations of eco-tourism mangrove management, promoting this place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities.

Keywords: Penida Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis

## **INTRODUCTION**

According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an unspoiled natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office of Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site. Based on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year. Considering this big number, opportunities for the development of mangrove eco-tourism in Nusa Penida island should be taken.

The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-organized. Facilities and infrastructures supporting eco-tourism activities themselves have not adequate. Moreover, information center which gives recent condition of mangrove forest has not yet available.

This research examined the potential of mangrove forests in Nusa Penida as a sacred and famous tourist area regarding its sustainability and feasibility or suitability to be developed as an eco-tourism site. Furthermore, development strategies which needs to be considered are also presented in this study.

## **LITERATURE REVIEW**

### **Development Strategies**

According Rangkuti (2006), a strategy is a comprehensive master planning which explains how to achieve the predetermined goals. Strategies in the development of tourism are classified as activities to seek conformity between internal forces (strengths and weaknesses) and external forces (opportunities and threats).

### **Mangrove**

Mangrove forest is a tropical beach vegetation community, dominated by several types of mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen, 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta, and estuaries.

### **Mangrove Density**

Density is the number of trees per unit area. The density of mangrove forest is one of indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove forest is used as a parameter in determining whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007).

### **Thickness Level of Mangrove Forests**

Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer line or the area which directly surrounded by sea water to mainland or association area. Findings of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).

### **The Potential of Mangrove Forest for Eco-tourism**

Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism activities which can be developed are tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply considering economic benefits which can be obtained without exploiting the mangrove itself (Kusmana and Istomo, 1993).

### **Ecological Suitability of Mangrove for Eco-tourism**

Eco-tourism activities planning should be tailored to the potential of natural resources and their allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1), appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and (5) biota.

### **Carrying Capacity of the Area**

Environmental carrying capacity refers to the capacity or ability of an ecosystem to support healthy organism life while maintain productivity, adaptability, and ability to renew itself. According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors which can be physically accommodated by the area provided at a certain time without causing disruption to both nature and humans.

### **Eco-tourism**

Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to enjoy the beauty of scenery and promote some elements of education in order to understand and support the environmental conservation efforts and the involvement of local communities in the eco-tourism destination areas for its management (Arida, 2016).

### **Local Community Participation**

In the development of an eco-tourism site, support and participation from the local community is obviously needed. This idea is in line with the concept of tourism development where eco-tourism development should rely on the development of local communities. A form of eco-tourism management needs to consider is community-based natural resource management. In its

implementation, the community is involved starts from planning to supervision stage (Tahir and Baharudin, 2002).

## RESEARCH METHODS

### Research Location and Timetable

The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose. The study has been conducted for 12 months, starting from November 2017 to October 2018.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N \max} \right] x 100\%$$

where:

CIT = Conformity Index for Tourism

N<sub>i</sub> = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K \times \frac{Lp}{Lt} \times \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

Lt = Area unit for certain category (m<sup>2</sup> or m)

Wt = Time provided by the region for tourism activities in one day (hours)

Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K (∑ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
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1	Sailing	5	100 m	0,5	8
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### **Analysis of Development Strategies for Mangrove Eco-tourism**

The technique used to create development strategy for mangrove eco-tourism was SWOT analysis. This analysis is a systematic identification of strategic factors to formulate a strategy (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths, weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal and external factors.

- a. Analysis of internal factors (strengths and weaknesses);
- b. Analysis of external factors (opportunities and threats);
- c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are principally grouped into three main categories, namely: a). Growth Strategy or growth of the activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and 8); b). Stability Strategy or a strategy which is implemented without changing the direction of the predetermined strategy (cells #4 and 5);
- c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).

## **FINDINGS AND DISCUSSION**

### **General Condition of the Researched Area**

Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high

school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### Conformity of Mangrove Eco-tourism (CIT)

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an IKW value of 25.64%. The existing mangrove types has a value of 9 with IKW value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).

### **Area Carrying Capacity (CC)**

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.

### **The Results of Internal Factor Strategic Analysis Summary (IFAS) and External Factor Strategic Analysis Summary (EFAS)**

The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which demands serious attention from the manager.

The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.

It was also identified that the highest weakness factor is the inadequate supporting facilities and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community.

The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. IE Matrix

**TOTAL SCORE OF INTERNAL FACTORS**

		STRONG	AVERAGE	WEAK	
		4,0	3,0	2,0	1,0
HIGH	3,0	I Growth Concentration through Vertical Integration	<b>II Growth Concentration through Horizontal Integration</b>	III Retrenchment Turn Around	
AVERAGE	2,0	IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment	
WEAK	1,0	VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation	

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.

- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development.
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
- d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management.
- e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **Conclusions**

Based on the results of research and analysis of internal and external factors of mangrove eco-tourism development in Nusa Penida island, some conclusions can be formulated as follows:

1. The potential of mangrove eco-tourism area:
  - a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as an eco-tourism site.
  - b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate tourists are 360 people for 8 hours each day.
2. The Main Strategies for mangrove eco-tourism development which can be done are presented in the following part:
  - a. Cooperating with all stakeholders related to mangrove eco-tourism development including doing promotion.
  - b. Inviting investors for the development of mangrove eco-tourism.
  - c. Increasing the types of services for tourists such as improving supporting facilities for eco-tourism activities.
  - d. Creating design plan and regulation of mangrove eco-tourism management.
  - e. Monitoring the tourist activities and implementing conservation-based tourist activities.

### **Recommendations**

1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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# MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA

## ABSTRACT

Nusa Penida Island is one of the most famous island in Bali Province has a big potential for eco-tourism development according to the data of foreign tourists visiting Nusa Penida district which is about more than 200,000 people per year. In the other side, Nusa Penida island have an important function as a buffer zone area of Bali Island. The study was conducted to assess the potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was assessed by calculating the tourist suitability index and carrying capacity of mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs in second quadrant. Some strategies of eco-tourism development in this mangrove forest are cooperating with all related stakeholders, inviting investors, improving types of tourist services such as improving all supporting facilities for eco-tourism activities, increasing the number of tourist attractions, designing plans and regulations of eco-tourism mangrove management, promoting this place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities. However, the main strategy to restore mangrove as an ecotourism destination is improving tourist infrastructure.

Keywords: Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis

## INTRODUCTION

According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an unspoiled natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office of Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site. Based on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year. Considering this big number, opportunities for the development of mangrove eco-tourism in Nusa Penida island should be taken.

The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-organized. Facilities and infrastructures supporting eco-tourism activities themselves have not

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3 adequate. Moreover, information center which give recent condition of mangrove forest has not  
4 yet available.  
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6 This research examined the potential of mangrove forests in Nusa Penida as a sacred and  
7 famous tourist area regarding its sustainability and feasibility or suitability to be developed as an  
8 eco-tourism site. Furthermore, development strategies which needs to be considered are also  
9 presented in this study.  
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## 12 **LITERATURE REVIEW**

### 13 **Development Strategies**

14 According Rangkuti (2006), a strategy is a comprehensive master planning which explains  
15 how to achieve the predetermined goals. Strategies in the development of tourism are classified as  
16 activities to seek conformity between internal forces (strengths and weaknesses) and external  
17 forces (opportunities and threats).  
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### 19 **Mangrove**

20 Mangrove forest is a tropical beach vegetation community, dominated by several types of  
21 mangrove trees which are able to grow and develop in strong tides and/or muddy beaches  
22 (Bengen, 2002). Vegetation of mangrove forest and its existence is determined by the influence of  
23 land and sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta,  
24 and estuaries.  
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### 26 **Mangrove Density**

27 Density is the number of trees per unit area. The density of mangrove forest is one of indicators  
28 in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove  
29 forest is used as a parameter in determining whether or not a mangrove forest should be used as an  
30 eco-tourism site (Yulianda, 2007).  
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### 32 **Thickness Level of Mangrove Forests**

33 Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer  
34 line or the area which directly surrounded by sea water to mainland or association area. Findings  
35 of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30  
36 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy  
37 (Dahuri, 1996).  
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### 39 **The Potential of Mangrove Forest for Eco-tourism**

40 Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-  
41 tourism activities which can be developed are tracking, marine activities, bird watching, education,  
42 and research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very  
43 rational new breakthrough needs to apply considering economic benefits which can be obtained  
44 without exploiting the mangrove itself (Kusmana and Istomo, 1993).  
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5 **Ecological Suitability of Mangrove for Eco-tourism**  
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7 Eco-tourism activities planning should be tailored to the potential of natural resources and  
8 their allocation. An ecological suitability index can identify whether the ecosystem is highly  
9 suitable (S1), appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction.  
10 There are five assessment parameters on the suitability of mangrove tourism (Yulianda, 2007).  
11 These parameters are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove  
12 density, (4) sea wave, and (5) biota.  
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17 **Carrying Capacity of the Area**  
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19 Environmental carrying capacity refers to the capacity or ability of an ecosystem to support  
20 healthy organism life while maintain productivity, adaptability, and ability to renew itself.  
21 According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors  
22 which can be physically accommodated by the area provided at a certain time without causing  
23 disruption to both nature and humans.  
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28 **Eco-tourism**  
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30 Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to  
31 enjoy the beauty of scenery and promote some elements of education in order to understand and  
32 support the environmental conservation efforts and the involvement of local communities in the  
33 eco-tourism destination areas for its management (Arida, 2016).  
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37 Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco  
38 tourism is used to describe trips to remote natural location for the purpose of enjoying and learning  
39 the nature and culture of local population. In 1996, Ceballos-Lascurain added the use  
40 environmentally friendly technology concepts in explaining ecotourism development.  
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45 **Local Community Participation**  
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47 In the development of an eco-tourism site, support and participation from the local community  
48 is obviously needed. This idea is in line with the concept of tourism development where eco-  
49 tourism development should rely on the development of local communities. A form of eco-tourism  
50 management needs to consider is community-based natural resource management. In its  
51 implementation, the community is involved starts from planning to supervision stage (Tahir and  
52 Baharudin, 2002).  
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57 **RESEARCH METHODS**  
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## Research Location and Timetable



The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist. The study has been conducted for 12 months, starting from November 2017 to October 2018.

The interview process was done at Nusa Penida Island. Deep interview used questioner for guiding the discussion.

## Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N \max} \right] x 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### **Analysis of Area Carrying Capacity (CC)**

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K x \frac{Lp}{Lt} x \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

Lt = Area unit for certain category (m<sup>2</sup> or m)

Wt = Time provided by the region for tourism activities in one day (hours)

Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K ( $\Sigma$ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

### Analysis of Development Strategies for Mangrove Eco-tourism

The technique used to create development strategy for mangrove eco-tourism was SWOT analysis. This analysis is a systematic identification of strategic factors to formulate a strategy (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths, weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal and external factors.

- a. Analysis of internal factors (strengths and weaknesses);
- b. Analysis of external factors (opportunities and threats);
- c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are principally grouped into three main categories, namely: a). Growth Strategy or growth of the activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and 8); b). Stability Strategy or a strategy which is implemented without changing the direction of the predetermined strategy (cells #4 and 5);
- c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).

## FINDINGS AND DISCUSSION

### General Condition of the Researched Area

Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a

population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### Conformity of Mangrove Eco-tourism (CIT)

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an IKW value of 25.64%. The existing mangrove types has a value of 9 with IKW value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its

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3 biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is  
4 extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove  
5 forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).  
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### 10 **Area Carrying Capacity (CC)**

11 The results of measurement and observation in the field found that the length of sailing path  
12 was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor  
13 was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.  
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16 Based on the area carrying capacity (CC), the maximum people joining the sailing path which  
17 can be accommodated are 360 people per day approximately for 8 hours. With the number of  
18 tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be  
19 improved. In certain months, the number of visits increased, as of July to September where it  
20 reached 400 tourists per day. This condition should receive serious attention by the mangrove tour  
21 managers. If the number of visits exceeds the maximum carrying capacity, activities should be  
22 arranged shifting each other or turned into another activities such as snorkeling or diving. These  
23 efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.  
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### 30 **The Results of Internal Factor Strategic Analysis Summary (IFAS) and** 31 **External Factor Strategic Analysis Summary (EFAS)**

32 The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed  
33 as an eco-tourism site, yet there are also various weaknesses or problems and threats in the  
34 implementation which demands serious attention from the manager.  
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38 The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses  
39 of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor  
40 gained by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a  
41 score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove  
42 vegetation types, and existing biodiversity have dominant power in eco-tourism development of  
43 mangrove eco-tourism.  
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47 It was also identified that the highest weakness factor is the inadequate supporting facilities  
48 and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the  
49 existing weakness factors, supporting facilities and infrastructures are perceived to have the least  
50 disadvantage.  
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53 The results of External Factor Analysis Summary (EFAS) which consist of opportunities and  
54 threat factors of mangrove eco-tourism development discover that the highest probability factor is  
55 the opening of new job alternative to increase the income of local community and the festival of  
56 Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of  
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mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community.

The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. IE Matrix

***TOTAL SCORE OF INTERNAL FACTORS***

	STRONG 4,0	AVERAGE 3,0	WEAK 2,0	1,0
HIGH 3,0	I Growth Concentration through Vertical Integration	<b>II Growth Concentration through Horizontal Integration</b>	III Retrenchment Turn Around	
AVERAGE 2,0	IV Stability Carefulness	V Growth Concentration though Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment	
WEAK 1,0	VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation	

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-

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4 Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism  
5 activities and their promotion as a tourism area.

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7 b. Inviting investors to develop mangrove eco-tourism especially to build its development  
8 facilities, to determine the pattern of eco-tourism mangrove development including conducting  
9 study on environmental impacts of mangrove eco-tourism development. However, upgrading  
10 environmentally infrastructure in coastal area inline with mangrove restoration. These  
11 program making coastal communities more safe and suitable with IUCN (2017).  
12  
13 c. Providing services to tourists in forms of facilities and infrastructures that supports the  
14 mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism,  
15 bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic  
16 toilet facilities.  
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18 d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of  
19 mangrove eco-tourism management and making regulations about mangrove eco-tourism  
20 management as well as stated by Pons and Fiselier (1991)  
21  
22 e. Monitoring and carrying out conservation-based tourism activities: calculating the area  
23 carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on  
24 tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove  
25 areas, and planting the mangrove areas that have less density.  
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## 32 33 **CONCLUSIONS AND RECOMMENDATIONS**

### 34 **Conclusions**

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36 Based on the results of research and analysis of internal and external factors of mangrove eco-  
37 tourism development in Nusa Penida island, some conclusions can be formulated as follows:

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39 1. The potential of mangrove eco-tourism area:  
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41 a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as  
42 an eco-tourism site.  
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44 b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate  
45 tourists are 360 people for 8 hours each day.  
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47 2. The Main Strategies for mangrove eco-tourism development which can be done are presented  
48 in the following part:  
49  
50 a. Cooperating with all stakeholders related to mangrove eco-tourism development including  
51 doing promotion.  
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53 b. Inviting investors for the development of mangrove eco-tourism.  
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55 c. Increasing the types of services for tourists such as improving supporting facilities for eco-  
56 tourism activities.  
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58 d. Creating design plan and regulation of mangrove eco-tourism management.  
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60 e. Monitoring the tourist activities and implementing conservation-based tourist activities.  
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## Recommendations

1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K ( $\Sigma$ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
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3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Table 4. Internal External Matrix

**TOTAL SCORE OF INTERNAL FACTORS**

	STRONG 4,0	AVERAGE 3,0	WEAK 2,0	1,0
HIGH 3,0	I Growth Concentration through Vertical Integration	II Growth Concentration through Horizontal Integration	III Retrenchment Turn Around	
AVERAGE 2,0	IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment	
WEAK 1,0	VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation	

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4 **MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA**  
5 **SACRED ISLAND IN BALI, INDONESIA**  
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28 **ABSTRACT**  
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31  
32 Nusa Penida Island is one of the most famous island in Bali Province has a big potential for eco-  
33 tourism development according to the data of foreign tourists visiting Nusa Penida district which  
34 is about more than 200,000 people per year. In the other side, Nusa Penida island have an  
35 important function as a buffer zone area of Bali Island. The study was conducted to assess the  
36 potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This  
37 potential was assessed by calculating the tourist suitability index and carrying capacity of  
38 mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by  
39 using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent,  
40 implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an  
41 eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day.  
42 The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal  
43 external matrix belongs in second quadrant. Some strategies of eco-tourism development in this  
44 mangrove forest are cooperating with all related stakeholders, inviting investors, improving types  
45 of tourist services such as improving all supporting facilities for eco-tourism activities, increasing  
46 the number of tourist attractions, designing plans and regulations of eco-tourism mangrove  
47 management, promoting this place to public and tourists, supervising tourist activities, and  
48 carrying out conservation-based tourist activities. However, the main strategy to restore mangrove  
49 as an ecotourism destination is improving tourist infrastructure.  
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52 Keywords: Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis  
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55 **INTRODUCTION**  
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57 According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest  
58 which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest  
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4 biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest  
5 locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically  
6 concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an  
7 unspoiled natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office  
8 of Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site.  
9 Based on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting  
10 Nusa Penida reached 200,000 people per year. Considering this big number, opportunities for the  
11 development of mangrove eco-tourism in Nusa Penida island should be taken.  
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15 The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-  
16 organized. Facilities and infrastructures supporting eco-tourism activities themselves have not  
17 adequate. Moreover, information center which give recent condition of mangrove forest has not  
18 yet available.  
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21 This research examined the potential of mangrove forests in Nusa Penida as a sacred and  
22 famous tourist area regarding its sustainability and feasibility or suitability to be developed as an  
23 eco-tourism site. Furthermore, development strategies which needs to be considered are also  
24 presented in this study.  
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## 28 29 30 **LITERATURE REVIEW**

### 31 **Development Strategies**

32 According Rangkuti (2006), a strategy is a comprehensive master planning which explains  
33 how to achieve the predetermined goals. Strategies in the development of tourism are classified as  
34 activities to seek conformity between internal forces (strengths and weaknesses) and external  
35 forces (opportunities and threats).  
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### 39 **Mangrove**

40 Mangrove forest is a tropical beach vegetation community, dominated by several types of  
41 mangrove trees which are able to grow and develop in strong tides and/or muddy beaches  
42 (Bengen, 2002). Vegetation of mangrove forest and its existence is determined by the influence of  
43 land and sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta,  
44 and estuaries.  
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### 48 **Mangrove Density**

49 Density is the number of trees per unit area. The density of mangrove forest is one of indicators  
50 in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove  
51 forest is used as a parameter in determining whether or not a mangrove forest should be used as an  
52 eco-tourism site (Yulianda, 2007).  
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### 56 **Thickness Level of Mangrove Forests**

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Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer line or the area which directly surrounded by sea water to mainland or association area. Findings of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).

### **The Potential of Mangrove Forest for Eco-tourism**

Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism activities which can be developed are tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply considering economic benefits which can be obtained without exploiting the mangrove itself (Kusmana and Istomo, 1993).

### **Ecological Suitability of Mangrove for Eco-tourism**

Eco-tourism activities planning should be tailored to the potential of natural resources and their allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1), appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and (5) biota.

### **Carrying Capacity of the Area**

Environmental carrying capacity refers to the capacity or ability of an ecosystem to support healthy organism life while maintain productivity, adaptability, and ability to renew itself. According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors which can be physically accommodated by the area provided at a certain time without causing disruption to both nature and humans.

### **Eco-tourism**

Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to enjoy the beauty of scenery and promote some elements of education in order to understand and support the environmental conservation efforts and the involvement of local communities in the eco-tourism destination areas for its management (Arida, 2016).

Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco tourism is used to describe trips to remote natural location for the purpose of enjoying and learning the nature and culture of local population. In 1996, Ceballos-Lascurain added the use environmentally friendly technology concepts in explaining ecotourism development.

## Local Community Participation

In the development of an eco-tourism site, support and participation from the local community is obviously needed. This idea is in line with the concept of tourism development where eco-tourism development should rely on the development of local communities. A form of eco-tourism management needs to consider is community-based natural resource management. In its implementation, the community is involved starts from planning to supervision stage (Tahir and Baharudin, 2002).

## RESEARCH METHODS

### Research Location and Timetable



The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist. The study has been conducted for 12 months, starting from November 2017 to October 2018.

The interview process was done at Nusa Penida Island. Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0

2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N \max} \right] x 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K x \frac{Lp}{Lt} x \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

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4 Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)  
5 Lt = Area unit for certain category (m<sup>2</sup> or m)  
6 Wt = Time provided by the region for tourism activities in one day (hours)  
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8 Wp = Time spent by visitors for each particular activity (hours)  
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19 Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K ( $\Sigma$ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

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31 **Analysis of Development Strategies for Mangrove Eco-tourism**

32 The technique used to create development strategy for mangrove eco-tourism was SWOT  
33 analysis. This analysis is a systematic identification of strategic factors to formulate a strategy  
34 (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths,  
35 weaknesses, opportunities, and threats in a speculation to determine strategies by identifying  
36 internal and external factors.  
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40 a. Analysis of internal factors (strengths and weaknesses);  
41 b. Analysis of external factors (opportunities and threats);  
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43 c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are  
44 principally grouped into three main categories, namely: a). Growth Strategy or growth of the  
45 activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and  
46 8); b). Stability Strategy or a strategy which is implemented without changing the direction of  
47 the predetermined strategy (cells #4 and 5);  
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49 c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).  
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54 **FINDINGS AND DISCUSSION**

55 **General Condition of the Researched Area**

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57 Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of  
58 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for  
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community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### Conformity of Mangrove Eco-tourism (CIT)

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08

3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an IKW value of 25.64%. The existing mangrove types has a value of 9 with IKW value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).

### **Area Carrying Capacity (CC)**

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.

### **The Results of Internal Factor Strategic Analysis Summary (IFAS) and External Factor Strategic Analysis Summary (EFAS)**

The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which demands serious attention from the manager.

The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor

gained by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.

It was also identified that the highest weakness factor is the inadequate supporting facilities and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community.

The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. IE Matrix

***TOTAL SCORE OF INTERNAL FACTORS***

	STRONG 4,0	AVERAGE 3,0	WEAK 2,0	1,0
HIGH 3,0	<b>I</b> Growth Concentration through Vertical Integration	<b>II</b> Growth Concentration through Horizontal Integration	<b>III</b> Retrenchment Turn Around	
AVERAGE 2,0	<b>IV</b> Stability Carefulness	<b>V</b> Growth Concentration though Horizontal Integration Stability No Change of Strategic Profit	<b>VI</b> Retrenchment Captive Company or Divestment	
WEAK 1,0				

VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation
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Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
- d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated by Pons and Fiselier (1991)
- e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

Based on the results of research and analysis of internal and external factors of mangrove eco-tourism development in Nusa Penida island, some conclusions can be formulated as follows:

1. The potential of mangrove eco-tourism area:



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- a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as an eco-tourism site.
  - b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate tourists are 360 people for 8 hours each day.
2. The Main Strategies for mangrove eco-tourism development which can be done are presented in the following part:
- a. Cooperating with all stakeholders related to mangrove eco-tourism development including doing promotion.
  - b. Inviting investors for the development of mangrove eco-tourism.
  - c. Increasing the types of services for tourists such as improving supporting facilities for eco-tourism activities.
  - d. Creating design plan and regulation of mangrove eco-tourism management.
  - e. Monitoring the tourist activities and implementing conservation-based tourist activities.

## 26 **Recommendations**

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1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
  2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
  3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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2. Bukti Review Artikel dan artikel yang direvisi

**Date:** 02 Jan 2022  
**To:** "Utari Vipriyanti" mangtiutari@yahoo.com  
**From:** "Environment, Development and Sustainability (ENVI)"  
cynthia.clement.1@springer.com  
**Subject:** Your Submission ENVI-D-19-00627R1

Dear Dr Vipriyanti,

We have received the reports from our advisors on your manuscript, "MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA", submitted to Environment, Development and Sustainability

Based on the advice received, I have decided that your manuscript can be accepted for publication after you have carried out the corrections as suggested by the reviewer(s). You are also requested to highlight the changes made on the revised manuscript.

Attached, please find the reviewers' comments for your perusal.

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I am looking forward to receiving your revised manuscript before 04 Mar 2022

Thank you.

With kind regards,  
Luc Hens  
Editor in Chief  
Environment, Development and Sustainability

COMMENTS TO THE AUTHOR:

Reviewer #3: Dear Utari, according to the proposal submitted, there are several critical points that should be carried out as below:

1. the analysis should consider to blue economy strategy.
2. the impact of visitors number within the area of mangrove should be defined along the conservation strategy (eg. 0-50 -> strategy taken etc.....)
3. mind the government policy (kementrian lingkungan hidup, kementrian kelautan perikanan dan kementrian pariwisata and local policy act.)

for a moment that will be all.

Thank you.

—

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## Authors' response to reviewers' comments

Dear all reviewers,

Thank you for giving us the opportunity to submit a revised draft of our manuscript titled "DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA" to the International Journal of Environment, Development and Sustainability. We really appreciate the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

## Response to Reviewer #1

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section.

### Comment #1:

According to the proposal submitted, there are several point that should be carrying out:

1. the analysis should consider to blue economy strategy

2. the impact of visitor number within the are of mangroves should be define along conservation strategy.

3. Mind the government policy (kementerian lingkungan hidup, kementerian kelautanperikanan dan kementerian pariwisata and local policy)

### Response #1:

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'response' section. We describe one by one to response every comment, become as follows:

1. We have added description about Blue Economy as follows:

The effort for safeguarding the world oceans, water resources and coastal area are in line with the blue economy concept. This concept emphasizes the balance of community activities in long term planning (Lee, Noh, & Khim, 2020). As a small island with abundant natural resources and uniqueness of culture, its regional development program must be sustainable an improve welfare community.

2. I agree with you; therefore, we have considered the analysis of mangrove development for conservation, not only for tourism, in the ecological paragraph as follows:

Eco-tourism activities planning should be tailored to the potential of natural resources and their allocation. An ecological suitability index can identify whether the ecosystem is highly suitable

(S1), appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five assessment parameters on the suitability of mangrove tourism (Yuliana, 2007). These parameters are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and (5) biota.

3. We have describe too about government policy and stated as follows (page 10,point d):

Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated by Pons and Fiselier (1991) and suitable with blue economy (Lee et al., 2020).

# Environment, Development and Sustainability

## MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA

--Manuscript Draft--

<b>Manuscript Number:</b>	ENVI-D-19-00627R2
<b>Full Title:</b>	MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA
<b>Article Type:</b>	Original paper
<b>Keywords:</b>	Sacred Island; Mangrove Eco Tourism; Tourist Suitability Index; SWOT Analysis
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<b>Funding Information:</b>	
<b>Abstract:</b>	Nusa Penida Island is one of the famous island in Bali Province has a big potential for eco-tourism development according to the data of foreign tourists visiting Nusa Penida district which is about more than 200,000 people per year. The study was conducted to assess the potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was assessed by calculating the tourist suitability index and carrying capacity of mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs in second quadrant. Some strategies of eco-tourism development in this mangrove forest are cooperating with all related stakeholders, inviting investors, improving types of tourist services such as improving all supporting facilities for eco-tourism activities, increasing the number of tourist attractions, designing plans and regulations of eco-tourism mangrove management, promoting this place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities.
<b>Response to Reviewers:</b>	Dear Reviewer, I have revised and added some discussion about blue economy, regulation in order environmental management for tourism. Hope this paper could be more complete. Thank you.



**MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND  
IN BALI, INDONESIA**

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**MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND  
IN BALI, INDONESIA**

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# MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA

## ABSTRACT

Nusa Penida Island is one of the most famous island in Bali Province has a big potential for eco-tourism development according to the data of foreign tourists visiting Nusa Penida district which is about more than 200,000 people per year. In the other side, Nusa Penida island have an important function as a buffer zone area of Bali Island. The study was conducted to assess the potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was assessed by calculating the tourist suitability index and carrying capacity of mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs in second quadrant. Some strategies of eco-tourism development in this mangrove forest are cooperating with all related stakeholders, inviting investors, improving types of tourist services such as improving all supporting facilities for eco-tourism activities, increasing the number of tourist attractions, designing plans and regulations of eco-tourism mangrove management, promoting this place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities. However, the main strategy to restore mangrove as an ecotourism destination is improving tourist infrastructure.

Keywords: Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis

## INTRODUCTION

According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an unspoiled natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office of Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site. Based on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year. Considering this big number, opportunities for the development of mangrove eco-tourism in Nusa Penida island should be taken.

The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-organized. Facilities and infrastructures supporting eco-tourism activities themselves have not

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4 adequate. Moreover, information center which give recent condition of mangrove forest has not yet  
5 available.

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7 This research examined the potential of mangrove forests in Nusa Penida as a sacred and famous  
8 tourist area regarding its sustainability and feasibility or suitability to be developed as an eco-tourism  
9 site. Furthermore, development strategies which needs to be considered are also presented in this  
10 study.  
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## 12 13 14 **LITERATURE REVIEW**

### 15 16 17 **Blue Economy (BE)**

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20 The effort for safeguarding the world oceans, water resources and coastal area are in line with  
21 the blue economy concept. This concept emphasizes the balance of community activities in long  
22 term planning (Lee, Noh, & Khim, 2020). As a small island with abundant natural resources and  
23 uniqueness of culture, its regional development program must be sustainable an improve welfare  
24 community.  
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### 28 29 30 **Development Strategies**

31 According Rangkuti (2006), a strategy is a comprehensive master planning which explains how  
32 to achieve the predetermined goals. Strategies in the development of tourism are classified as  
33 activities to seek conformity between internal forces (strengths and weaknesses) and external forces  
34 (opportunities and threats).  
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### 38 39 40 **Mangrove Density**

41 Mangrove forest is a tropical beach vegetation community, dominated by several types of  
42 mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen,  
43 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and  
44 sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta, and estuaries.

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47 Mangrove Density is the number of trees per unit area. The density of mangrove forest is one of  
48 indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of  
49 mangrove forest is used as a parameter in determining whether or not a mangrove forest should be  
50 used as an eco-tourism site (Yulianda, 2007).  
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### 54 55 56 **Thickness Level of Mangrove Forests**

57 Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer  
58 line or the area which directly surrounded by sea water to mainland or association area. Findings of  
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3 a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees  
4 per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).  
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## 7 8 **The Potential of Mangrove Forest for Eco-tourism** 9

10 Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism  
11 activities which can be developed are tracking, marine activities, bird watching, education, and  
12 research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very  
13 rational new breakthrough needs to apply considering economic benefits which can be obtained  
14 without exploiting the mangrove itself (Kusmana and Istomo, 1993). In accordance with the  
15 regulation of tourism affair number 33, 2009, the regional development of ecotourism in Bali has  
16 to maintain the existence of ecological and also improve the community welfare.  
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## 22 **Ecological Suitability of Mangrove for Eco-tourism** 23

24 Eco-tourism activities planning should be tailored to the potential of natural resources and their  
25 allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1),  
26 appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five  
27 assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters  
28 are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and  
29 (5) biota.  
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## 35 **Carrying Capacity of the Area** 36

37 Environmental carrying capacity refers to the capacity or ability of an ecosystem to support  
38 healthy organism life while maintain productivity, adaptability, and ability to renew itself.  
39 According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors  
40 which can be physically accommodated by the area provided at a certain time without causing  
41 disruption to both nature and humans.  
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## 46 **Eco-tourism** 47

48 Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to  
49 enjoy the beauty of scenery and promote some elements of education in order to understand and  
50 support the environmental conservation efforts and the involvement of local communities in the eco-  
51 tourism destination areas for its management (Arida, 2016).  
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54 Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco  
55 tourism is used to describe trips to remote natural location for the purpose of enjoying and learning  
56 the nature and culture of local population. In 1996, Ceballos-Lascurain added the use  
57 environmentally friendly technology concepts in explaining ecotourism development.  
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## Local Community Participation

In the development of an eco-tourism site, support and participation from the local community is obviously needed. This idea is in line with the concept of tourism development where eco-tourism development should rely on the development of local communities. A form of eco-tourism management needs to consider is community-based natural resource management. In its implementation, the community is involved starts from planning to supervision stage (Tahir and Baharudin, 2002).

## RESEARCH METHODS

### Research Location and Timetable

The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research



object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist. The study has been conducted for 12 months, starting from November 2017 to October 2018. The interview process was done at Nusa Penida Island.

Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0

3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N_{max}} \right] \times 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K \times \frac{Lp}{Lt} \times \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

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4 Lt = Area unit for certain category (m<sup>2</sup> or m)  
5 Wt = Time provided by the region for tourism activities in one day (hours)  
6 Wp = Time spent by visitors for each particular activity (hours)  
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17 Table 2. Criteria of Carrying Capacity for Mangrove Exploration  
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No	Types of Activities	K ( $\Sigma$ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

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29 **Analysis of Development Strategies for Mangrove Eco-tourism**

30 The technique used to create development strategy for mangrove eco-tourism was SWOT  
31 analysis. This analysis is a systematic identification of strategic factors to formulate a strategy  
32 (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths,  
33 weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal  
34 and external factors.  
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38 a. Analysis of internal factors (strengths and weaknesses);  
39 b. Analysis of external factors (opportunities and threats);  
40 c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are  
41 principally grouped into three main categories, namely: a). Growth Strategy or growth of the  
42 activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and  
43 8); b). Stability Strategy or a strategy which is implemented without changing the direction of  
44 the predetermined strategy (cells #4 and 5);  
45  
46 c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).  
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52 **FINDINGS AND DISCUSSION**

53 **General Condition of the Researched Area**

54 Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397  
55 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for  
56 community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.  
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50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### Conformity of Mangrove Eco-tourism (CIT)

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08

3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9 with CIT value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).

### **Area Carrying Capacity (CC)**

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.

### **The Results of Internal Factor Strategic Analysis Summary (IFAS) and External Factor Strategic Analysis Summary (EFAS)**

The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which demands serious attention from the manager.

The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained

by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.

It was also identified that the highest weakness factor is the inadequate supporting facilities and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community.

The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. IE Matrix

***TOTAL SCORE OF INTERNAL FACTORS***

	STRONG 4,0	AVERAGE 3,0	WEAK 2,0	1,0
HIGH 3,0	I Growth Concentration through Vertical Integration	<b>II Growth Concentration through Horizontal Integration</b>	III Retrenchment Turn Around	
AVERAGE 2,0	IV Stability Carefulness	V Growth Concentration though Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment	
WEAK 1,0				

VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation
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Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
- d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated by Pons and Fiselier (1991) and suitable with blue economy (Lee et al., 2020).
- e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

Based on the results of research and analysis of internal and external factors of mangrove eco-tourism development in Nusa Penida island, some conclusions can be formulated as follows:

1. The potential of mangrove eco-tourism area:

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- a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as an eco-tourism site.
  - b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate tourists are 360 people for 8 hours each day.
2. The Main Strategies for mangrove eco-tourism development which can be done are presented in the following part:
- a. Cooperating with all stakeholders related to mangrove eco-tourism development including doing promotion.
  - b. Inviting investors for the development of mangrove eco-tourism.
  - c. Increasing the types of services for tourists such as improving supporting facilities for eco-tourism activities.
  - d. Creating design plan and regulation of mangrove eco-tourism management.
  - e. Monitoring the tourist activities and implementing conservation-based tourist activities.

## 26 **Recommendations**

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1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
  2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
  3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K ( $\Sigma$ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Table 4. Internal External Matrix

**TOTAL SCORE OF INTERNAL FACTORS**

	STRONG 4,0	AVERAGE 3,0	WEAK 2,0	1,0
HIGH 3,0	I Growth Concentration through Vertical Integration	II Growth Concentration through Horizontal Integration	III Retrenchment Turn Around	
AVERAGE 2,0	IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment	
WEAK 1,0	VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation	



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4 **MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA**  
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6 **SACRED ISLAND IN BALI, INDONESIA**  
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28 **ABSTRACT**  
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32 Nusa Penida Island is one of the most famous island in Bali Province has a big potential for eco-  
33 tourism development according to the data of foreign tourists visiting Nusa Penida district which is  
34 about more than 200,000 people per year. In the other side, Nusa Penida island have an important  
35 function as a buffer zone area of Bali Island. The study was conducted to assess the potential of  
36 mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was  
37 assessed by calculating the tourist suitability index and carrying capacity of mangrove forest  
38 tracking path for mangrove tour. Some development strategies were analyzed by using SWOT  
39 analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that  
40 the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site  
41 with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total  
42 IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs  
43 in second quadrant. Some strategies of eco-tourism development in this mangrove forest are  
44 cooperating with all related stakeholders, inviting investors, improving types of tourist services such  
45 as improving all supporting facilities for eco-tourism activities, increasing the number of tourist  
46 attractions, designing plans and regulations of eco-tourism mangrove management, promoting this  
47 place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist  
48 activities. However, the main strategy to restore mangrove as an ecotourism destination is  
49 improving tourist infrastructure.  
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52 Keywords: Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis  
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55 **INTRODUCTION**  
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57 According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest  
58 which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest  
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3 biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest  
4 locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically  
5 concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an unspoiled  
6 natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office of  
7 Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site. Based  
8 on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting Nusa Penida  
9 reached 200,000 people per year. Considering this big number, opportunities for the development  
10 of mangrove eco-tourism in Nusa Penida island should be taken.

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The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-  
organized. Facilities and infrastructures supporting eco-tourism activities themselves have not  
adequate. Moreover, information center which give recent condition of mangrove forest has not yet  
available.

This research examined the potential of mangrove forests in Nusa Penida as a sacred and famous  
tourist area regarding its sustainability and feasibility or suitability to be developed as an eco-tourism  
site. Furthermore, development strategies which needs to be considered are also presented in this  
study.

## LITERATURE REVIEW

### Blue Economy (BE)

The effort for safeguarding the world oceans, water resources and coastal area are in line with  
the blue economy concept. This concept emphasizes the balance of community activities in long  
term planning (Lee, Noh, & Khim, 2020). As a small island with abundant natural resources and  
uniqueness of culture, its regional development program must be sustainable an improve welfare  
community.

### Development Strategies

According Rangkuti (2006), a strategy is a comprehensive master planning which explains how  
to achieve the predetermined goals. Strategies in the development of tourism are classified as  
activities to seek conformity between internal forces (strengths and weaknesses) and external forces  
(opportunities and threats).

### Mangrove

Mangrove forest is a tropical beach vegetation community, dominated by several types of  
mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen,  
2002). Vegetation of mangrove forest and its existence is determined by the influence of land and  
sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta, and estuaries.

### Mangrove Density

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Density is the number of trees per unit area. The density of mangrove forest is one of indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove forest is used as a parameter in determining whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007).

### **Thickness Level of Mangrove Forests**

Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer line or the area which directly surrounded by sea water to mainland or association area. Findings of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).

### **The Potential of Mangrove Forest for Eco-tourism**

Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism activities which can be developed are tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply considering economic benefits which can be obtained without exploiting the mangrove itself (Kusmana and Istomo, 1993).

### **Ecological Suitability of Mangrove for Eco-tourism**

Eco-tourism activities planning should be tailored to the potential of natural resources and their allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1), appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and (5) biota.

### **Carrying Capacity of the Area**

Environmental carrying capacity refers to the capacity or ability of an ecosystem to support healthy organism life while maintain productivity, adaptability, and ability to renew itself. According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors which can be physically accommodated by the area provided at a certain time without causing disruption to both nature and humans.

### **Eco-tourism**

Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to enjoy the beauty of scenery and promote some elements of education in order to understand and support the environmental conservation efforts and the involvement of local communities in the eco-tourism destination areas for its management (Arida, 2016).

Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco tourism is used to describe trips to remote natural location for the purpose of enjoying and learning the nature and culture of local population. In 1996, Ceballos-Lascurain added the use environmentally friendly technology concepts in explaining ecotourism development.

### Local Community Participation

In the development of an eco-tourism site, support and participation from the local community is obviously needed. This idea is in line with the concept of tourism development where eco-tourism development should rely on the development of local communities. A form of eco-tourism management needs to consider is community-based natural resource management. In its implementation, the community is involved starts from planning to supervision stage (Tahir and Baharudin, 2002).

## RESEARCH METHODS

### Research Location and Timetable

The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research



object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist. The study has been conducted for 12 months, starting from November 2017 to October 2018. The interview process was done at Nusa Penida Island.

Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
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			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N \max} \right] \times 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K \times \frac{Lp}{Lt} \times \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

Lt = Area unit for certain category (m<sup>2</sup> or m)

Wt = Time provided by the region for tourism activities in one day (hours)

Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K (∑ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

### Analysis of Development Strategies for Mangrove Eco-tourism

The technique used to create development strategy for mangrove eco-tourism was SWOT analysis. This analysis is a systematic identification of strategic factors to formulate a strategy (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths, weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal and external factors.

- a. Analysis of internal factors (strengths and weaknesses);
- b. Analysis of external factors (opportunities and threats);
- c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are principally grouped into three main categories, namely: a). Growth Strategy or growth of the activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and 8); b). Stability Strategy or a strategy which is implemented without changing the direction of the predetermined strategy (cells #4 and 5);
- c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).

## **FINDINGS AND DISCUSSION**

### **General Condition of the Researched Area**

Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### **Conformity of Mangrove Eco-tourism (CIT)**

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9 with CIT value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).

### Area Carrying Capacity (CC)

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.



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4 **The Results of Internal Factor Strategic Analysis Summary (IFAS) and**  
5 **External Factor Strategic Analysis Summary (EFAS)**  
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7 The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed  
8 as an eco-tourism site, yet there are also various weaknesses or problems and threats in the  
9 implementation which demands serious attention from the manager.

10  
11 The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of  
12 mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained  
13 by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33.  
14 It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and  
15 existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.  
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18  
19 It was also identified that the highest weakness factor is the inadequate supporting facilities and  
20 infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing  
21 weakness factors, supporting facilities and infrastructures are perceived to have the least  
22 disadvantage.  
23  
24

25 The results of External Factor Analysis Summary (EFAS) which consist of opportunities and  
26 threat factors of mangrove eco-tourism development discover that the highest probability factor is  
27 the opening of new job alternative to increase the income of local community and the festival of  
28 Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of  
29 mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive  
30 impact the income of local community.  
31  
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33 The threat factor which gains the highest score is competition with other attractions with a score  
34 of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with  
35 other tourism objects in Bali.  
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38 From the results of internal environmental factor analysis, it was found that the development of  
39 mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the  
40 external factor analysis is in the "High" position with an average score of 3.09. The merger of these  
41 two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).  
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47 Table 4. IE Matrix

48 **TOTAL SCORE OF INTERNAL FACTORS**

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		STRONG	AVERAGE	WEAK	
		4,0	3,0	2,0	1,0
HIGH	3,0	I Growth Concentration through Vertical Integration	II Growth Concentration through Horizontal Integration	III Retrenchment Turn Around	
	AVERAGE				
	2,0				
	WEAK				

65

IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment
VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
- d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated by Pons and Fiselier (1991) and suitable with blue economy (Lee et al., 2020).
- e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## CONCLUSIONS AND RECOMMENDATIONS

## Conclusions

Based on the results of research and analysis of internal and external factors of mangrove eco-tourism development in Nusa Penida island, some conclusions can be formulated as follows:

1. The potential of mangrove eco-tourism area:
  - a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as an eco-tourism site.
  - b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate tourists are 360 people for 8 hours each day.
2. The Main Strategies for mangrove eco-tourism development which can be done are presented in the following part:
  - a. Cooperating with all stakeholders related to mangrove eco-tourism development including doing promotion.
  - b. Inviting investors for the development of mangrove eco-tourism.
  - c. Increasing the types of services for tourists such as improving supporting facilities for eco-tourism activities.
  - d. Creating design plan and regulation of mangrove eco-tourism management.
  - e. Monitoring the tourist activities and implementing conservation-based tourist activities.

## Recommendations

1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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# **MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA**

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## **ABSTRACT**

Nusa Penida Island is one of the most famous island in Bali Province has a big potential for eco-tourism development according to the data of foreign tourists visiting Nusa Penida district which is about more than 200,000 people per year. In the other side, Nusa Penida island have an important function as a buffer zone area of Bali Island. The study was conducted to assess the potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was assessed by calculating the tourist suitability index and carrying capacity of mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs in second quadrant. Some strategies of eco-tourism development in this mangrove forest are cooperating with all related stakeholders, inviting investors, improving types of tourist services such as improving all supporting facilities for eco-tourism activities, increasing the number of tourist attractions, designing plans and regulations of eco-tourism mangrove management, promoting this place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities. However, the main strategy to restore mangrove as an ecotourism destination is improving tourist infrastructure.

Keywords: Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis

## **INTRODUCTION**

According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest

biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an unspoiled natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office of Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site. Based on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year. Considering this big number, opportunities for the development of mangrove eco-tourism in Nusa Penida island should be taken.

The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-organized. Facilities and infrastructures supporting eco-tourism activities themselves have not adequate. Moreover, information center which give recent condition of mangrove forest has not yet available.

This research examined the potential of mangrove forests in Nusa Penida as a sacred and famous tourist area regarding its sustainability and feasibility or suitability to be developed as an eco-tourism site. Furthermore, development strategies which needs to be considered are also presented in this study.

## **LITERATURE REVIEW**

### **Blue Economy (BE)**

The effort for safeguarding the world oceans, water resources and coastal area are in line with the blue economy concept. This concept emphasizes the balance of community activities in long term planning (Lee, Noh, & Khim, 2020). As a small island with abundant natural resources and uniqueness of culture, its regional development program must be sustainable an improve welfare community.

### **Development Strategies**

According Rangkuti (2006), a strategy is a comprehensive master planning which explains how to achieve the predetermined goals. Strategies in the development of tourism are classified as activities to seek conformity between internal forces (strengths and weaknesses) and external forces (opportunities and threats).

### **Mangrove**

Mangrove forest is a tropical beach vegetation community, dominated by several types of mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen, 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta, and estuaries.

### **Mangrove Density**

Density is the number of trees per unit area. The density of mangrove forest is one of indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove forest is used as a parameter in determining whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007).

### **Thickness Level of Mangrove Forests**

Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer line or the area which directly surrounded by sea water to mainland or association area. Findings of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).

### **The Potential of Mangrove Forest for Eco-tourism**

Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism activities which can be developed are tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply considering economic benefits which can be obtained without exploiting the mangrove itself (Kusmana and Istomo, 1993).

### **Ecological Suitability of Mangrove for Eco-tourism**

Eco-tourism activities planning should be tailored to the potential of natural resources and their allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1), appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and (5) biota.

### **Carrying Capacity of the Area**

Environmental carrying capacity refers to the capacity or ability of an ecosystem to support healthy organism life while maintain productivity, adaptability, and ability to renew itself. According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors which can be physically accommodated by the area provided at a certain time without causing disruption to both nature and humans.

### **Eco-tourism**

Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to enjoy the beauty of scenery and promote some elements of education in order to understand and support the environmental conservation efforts and the involvement of local communities in the eco-tourism destination areas for its management (Arida, 2016).

Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco tourism is used to describe trips to remote natural location for the purpose of enjoying and learning the nature and culture of local population. In 1996, Ceballos-Lascurain added the use environmentally friendly technology concepts in explaining ecotourism development.

### Local Community Participation

In the development of an eco-tourism site, support and participation from the local community is obviously needed. This idea is in line with the concept of tourism development where eco-tourism development should rely on the development of local communities. A form of eco-tourism management needs to consider is community-based natural resource management. In its implementation, the community is involved starts from planning to supervision stage (Tahir and Baharudin, 2002).

## RESEARCH METHODS

### Research Location and Timetable

The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research



object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist. The study has been conducted for 12 months, starting from November 2017 to October 2018. The interview process was done at Nusa Penida Island.

Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
----	-----------	--------	----------	-------	----------	-------	----------	-------	----------	-------



		S1	S2	S3	N					
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N_{max}} \right] \times 100\%$$

where:

CIT = Conformity Index for Tourism

N<sub>i</sub> = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### **Analysis of Area Carrying Capacity (CC)**

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K \times \frac{Lp}{Lt} \times \frac{Wt}{Wp}$$

where :

- CC = Area Carrying Capacity (people per day)
- K = The ecological potential of visitors per area unit (people)
- Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)
- Lt = Area unit for certain category (m<sup>2</sup> or m)
- Wt = Time provided by the region for tourism activities in one day (hours)
- Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K (∑ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

### Analysis of Development Strategies for Mangrove Eco-tourism

The technique used to create development strategy for mangrove eco-tourism was SWOT analysis. This analysis is a systematic identification of strategic factors to formulate a strategy (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths, weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal and external factors.

- a. Analysis of internal factors (strengths and weaknesses);
- b. Analysis of external factors (opportunities and threats);
- c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are principally grouped into three main categories, namely: a). Growth Strategy or growth of the activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and 8); b). Stability Strategy or a strategy which is implemented without changing the direction of the predetermined strategy (cells #4 and 5);
- c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).

## **FINDINGS AND DISCUSSION**

### **General Condition of the Researched Area**

Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### **Conformity of Mangrove Eco-tourism (CIT)**

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5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9 with CIT value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).

### Area Carrying Capacity (CC)

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.

## The Results of Internal Factor Strategic Analysis Summary (IFAS) and External Factor Strategic Analysis Summary (EFAS)

The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which demands serious attention from the manager.

The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.

It was also identified that the highest weakness factor is the inadequate supporting facilities and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community.

The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. IE Matrix

		<b>TOTAL SCORE OF INTERNAL FACTORS</b>			
		<b>STRONG</b>	<b>AVERAGE</b>	<b>WEAK</b>	
		4,0	3,0	2,0	1,0
HIGH	3,0	I Growth Concentration through Vertical Integration	II Growth Concentration through Horizontal Integration	III Retrenchment Turn Around	
	AVERAGE				
	2,0				
	WEAK				

IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment
VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
- d. **Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated by Pons and Fiselier (1991) and suitable with blue economy (Lee et al., 2020).**
- e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## CONCLUSIONS AND RECOMMENDATIONS

## **Conclusions**

Based on the results of research and analysis of internal and external factors of mangrove eco-tourism development in Nusa Penida island, some conclusions can be formulated as follows:

1. The potential of mangrove eco-tourism area:
  - a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as an eco-tourism site.
  - b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate tourists are 360 people for 8 hours each day.
2. The Main Strategies for mangrove eco-tourism development which can be done are presented in the following part:
  - a. Cooperating with all stakeholders related to mangrove eco-tourism development including doing promotion.
  - b. Inviting investors for the development of mangrove eco-tourism.
  - c. Increasing the types of services for tourists such as improving supporting facilities for eco-tourism activities.
  - d. Creating design plan and regulation of mangrove eco-tourism management.
  - e. Monitoring the tourist activities and implementing conservation-based tourist activities.

## **Recommendations**

1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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**Date:** 18 Apr 2022  
**To:** "Utari Vipriyanti" mangtiutari@yahoo.com  
**From:** "Environment, Development and Sustainability (ENVI)"  
cynthia.clement.1@springer.com  
**Subject:** Major Revisions requested ENVI-D-19-00627R2

Dear Dr Vipriyanti,

We have received the reports from our advisors on your manuscript, "MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA", which you submitted to Environment, Development and Sustainability.

Based on the advice received, I feel that your manuscript could be reconsidered for publication should you be prepared to incorporate major revisions.

When preparing your revised manuscript, you are asked to carefully consider the reviewer comments which are attached, and submit a list of responses to the comments. You are also requested to highlight the changes made on the revised manuscript.

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With kind regards,  
Luc Hens  
Editor in Chief  
Environment, Development and Sustainability

COMMENTS TO THE AUTHOR:

Reviewer #4:  
Manuscript Number ENVI-D-19-00627R2  
Title: MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA

Please, do the following:

At first, follow the journal style.

Abstract need to improve (add statistical results).

What are the original, novelty, or unique ideas behind this research as compared to previous research/other reported work? Why it is worth knowing?

The logic of the current introduction should be revised, objectives of this study need to be changed. Graphic quality of many figures does not satisfy with publication standard. Provide the maps in high dpi resolution. (add number of figure and title. for example: Figure 1: case study.... ).

Check if you have included enough details on statistics (number of replicates, statistical tests performed, presentation of average and standard deviation or error values, both in tables and graphs), and complete it if needed.

Below references must be added for experimental design explanation in SWOT analysis, GIS and discussed in detail:

<https://doi.org/10.1007/s41324-017-0135-1>

[doi:10.1088/1755-1315/126/1/012109](https://doi.org/10.1088/1755-1315/126/1/012109)

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Nearly all journal articles are divided into the following major sections: abstract, introduction, methods, results, discussion, and references. Please follow it.

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## **Authors' response to reviewers' comments**

Dear all reviewers,

Thank you for giving us the opportunity to submit a revised draft of our manuscript titled "DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA" to the International Journal of Environment, Development and Sustainability. We really appreciate the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

### **Response to Reviewer #3**

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section.

#### **Comment #1:**

The author does not explain and elaborate more deeply on each finding (tables/figures) by confirming similar studies/library review. Thus, the author does not get a complete picture of the purpose of his research.

Authors need to adopt more reading material, add references, elaborate, in order to produce enrichment of theoretical concepts and implementation of their research

The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal

#### **Response #1:**

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'response' section. We describe one by one to response every comment, become as follows:

*"The effort for developing mangrove area to be sustainable tourism should optimize natural resources use and respect the sociocultural characteristics of local communities. This result was supported by former research result that stated some mangrove area suitable to be ecotourism destinationa (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021) (page 9).*

*Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. Recently, the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. This number of person below the capacity of Lembar mangrove ecotourism in Lombok Island which reached 2337 people per day (Sukuryadi, Harahab, Primyastanto, & Semedi, 2020). On the other side, the limited capacity of Nusa Penida due to the topography and it sacredness. Unfortunately, in pick season, as of July to September, the number of visits increased sharply until 400 tourists per day. This condition should get serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another*

*activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in this island (page 9).*

*Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated that sustainable mangrove ecotourism should be based on local wisdom and designated by appropriate regulation and policies (Syafri Harto, 2021) and suitable with blue economy principle (Lee et al., 2020) (page 11)".*

**Comment #2:**

The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal

**Response #2:**

We agree with this and have incorporated your suggestion throughout the manuscript. We have, accordingly, revised and put some detailed explanations Please find some improvement in our manuscript onpage 9-11.

*"The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which need serious attention from the manager. The suitable strategy should develop based on existing condition involving elements of strengths, weaknesses, opportunities and threats. In addition, the right strategy can avoid damage to natural and institutional resources".*

# Environment, Development and Sustainability

## MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA

--Manuscript Draft--

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<b>Funding Information:</b>	
<b>Abstract:</b>	Nusa Penida Island is one of the famous island in Bali Province has a big potential for eco-tourism development according to the data of foreign tourists visiting Nusa Penida district which is about more than 200,000 people per year. The study was conducted to assess the potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was assessed by calculating the tourist suitability index and carrying capacity of mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs in second quadrant. Some strategies of eco-tourism development in this mangrove forest are cooperating with all related stakeholders, inviting investors, improving types of tourist services such as improving all supporting facilities for eco-tourism activities, increasing the number of tourist attractions, designing plans and regulations of eco-tourism mangrove management, promoting this place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities.
<b>Response to Reviewers:</b>	Dear Reviewer, I have revised and added some discussion about blue economy, regulation in order environmental management for tourism. Hope this paper could be more complete. Thank you.

**MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND  
IN BALI, INDONESIA**

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**MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND  
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# MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA

## ABSTRACT

Nusa Penida Island is one of the most famous island in Bali Province has a big potential for eco-tourism development according to the data of foreign tourists visiting Nusa Penida district which is about more than 200,000 people per year. In the other side, Nusa Penida island have an important function as a buffer zone area of Bali Island. The study was conducted to assess the potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was assessed by calculating the tourist suitability index and carrying capacity of mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs in second quadrant. Some strategies of eco-tourism development in this mangrove forest are cooperating with all related stakeholders, inviting investors, improving types of tourist services such as improving all supporting facilities for eco-tourism activities, increasing the number of tourist attractions, designing plans and regulations of eco-tourism mangrove management, promoting this place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities. However, the main strategy to restore mangrove as an ecotourism destination is improving tourist infrastructure.

Keywords: Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis

## INTRODUCTION

According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an unspoiled natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office of Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site. Based on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year. Considering this big number, opportunities for the development of mangrove eco-tourism in Nusa Penida island should be taken.

The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-organized. Facilities and infrastructures supporting eco-tourism activities themselves have not



1  
2  
3  
4 adequate. Moreover, information center which give recent condition of mangrove forest has not yet  
5 available.

6  
7 This research examined the potential of mangrove forests in Nusa Penida as a sacred and famous  
8 tourist area regarding its sustainability and feasibility or suitability to be developed as an eco-tourism  
9 site. Furthermore, development strategies which needs to be considered are also presented in this  
10 study.

## 11 12 13 **LITERATURE REVIEW**

### 14 15 16 **Blue Economy (BE)**

17  
18 The effort for safeguarding the world oceans, water resources and coastal area are in line with  
19 the blue economy concept. This concept emphasizes the balance of community activities in long  
20 term planning (Lee, Noh, & Khim, 2020). As a small island with abundant natural resources and  
21 uniqueness of culture, its regional development program must be sustainable an improve welfare  
22 community.

### 23 24 25 **Development Strategies**

26  
27 According Rangkuti (2006), a strategy is a comprehensive master planning which explains how  
28 to achieve the predetermined goals. Strategies in the development of tourism are classified as  
29 activities to seek conformity between internal forces (strengths and weaknesses) and external forces  
30 (opportunities and threats).

### 31 32 33 **Mangrove Density**

34  
35 Mangrove forest is a tropical beach vegetation community, dominated by several types of  
36 mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen,  
37 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and  
38 sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta, and estuaries.

39  
40 Mangrove Density is the number of trees per unit area. The density of mangrove forest is one of  
41 indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of  
42 mangrove forest is used as a parameter in determining whether or not a mangrove forest should be  
43 used as an eco-tourism site (Yulianda, 2007).

### 44 45 46 **Thickness Level of Mangrove Forests**

47  
48 Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer  
49 line or the area which directly surrounded by sea water to mainland or association area. Findings of  
50

1  
2  
3 a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees  
4 per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).  
5  
6

## 7 8 **The Potential of Mangrove Forest for Eco-tourism** 9

10 Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism  
11 activities which can be developed are tracking, marine activities, bird watching, education, and  
12 research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very  
13 rational new breakthrough needs to apply considering economic benefits which can be obtained  
14 without exploiting the mangrove itself (Kusmana and Istomo, 1993). In accordance with the  
15 regulation of tourism affair number 33, 2009, the regional development of ecotourism in Bali has  
16 to maintain the existence of ecological and also improve the community welfare.  
17  
18  
19  
20  
21

## 22 **Ecological Suitability of Mangrove for Eco-tourism** 23

24 Eco-tourism activities planning should be tailored to the potential of natural resources and their  
25 allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1),  
26 appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five  
27 assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters  
28 are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and  
29 (5) biota.  
30  
31  
32  
33  
34

## 35 **Carrying Capacity of the Area** 36

37 Environmental carrying capacity refers to the capacity or ability of an ecosystem to support  
38 healthy organism life while maintain productivity, adaptability, and ability to renew itself.  
39 According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors  
40 which can be physically accommodated by the area provided at a certain time without causing  
41 disruption to both nature and humans.  
42  
43  
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45

## 46 **Eco-tourism** 47

48 Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to  
49 enjoy the beauty of scenery and promote some elements of education in order to understand and  
50 support the environmental conservation efforts and the involvement of local communities in the eco-  
51 tourism destination areas for its management (Arida, 2016).  
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54 Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco  
55 tourism is used to describe trips to remote natural location for the purpose of enjoying and learning  
56 the nature and culture of local population. In 1996, Ceballos-Lascurain added the use  
57 environmentally friendly technology concepts in explaining ecotourism development.  
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## Local Community Participation

In the development of an eco-tourism site, support and participation from the local community is obviously needed. This idea is in line with the concept of tourism development where eco-tourism development should rely on the development of local communities. A form of eco-tourism management needs to consider is community-based natural resource management. In its implementation, the community is involved starts from planning to supervision stage (Tahir and Baharudin, 2002).

## RESEARCH METHODS

### Research Location and Timetable

The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research



object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist. The study has been conducted for 12 months, starting from November 2017 to October 2018. The interview process was done at Nusa Penida Island.

Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0

3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N_{max}} \right] \times 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K \times \frac{Lp}{Lt} \times \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

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4 Lt = Area unit for certain category (m<sup>2</sup> or m)  
5 Wt = Time provided by the region for tourism activities in one day (hours)  
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7 Wp = Time spent by visitors for each particular activity (hours)  
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17 Table 2. Criteria of Carrying Capacity for Mangrove Exploration  
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No	Types of Activities	K ( $\Sigma$ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

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29 **Analysis of Development Strategies for Mangrove Eco-tourism**

30 The technique used to create development strategy for mangrove eco-tourism was SWOT  
31 analysis. This analysis is a systematic identification of strategic factors to formulate a strategy  
32 (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths,  
33 weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal  
34 and external factors.  
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38 a. Analysis of internal factors (strengths and weaknesses);  
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40 b. Analysis of external factors (opportunities and threats);  
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42 c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are  
43 principally grouped into three main categories, namely: a). Growth Strategy or growth of the  
44 activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and  
45 8); b). Stability Strategy or a strategy which is implemented without changing the direction of  
46 the predetermined strategy (cells #4 and 5);  
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48 c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).  
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52 **FINDINGS AND DISCUSSION**

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54 **General Condition of the Researched Area**

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56 Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397  
57 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for  
58 community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.  
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50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### Conformity of Mangrove Eco-tourism (CIT)

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08

3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9 with CIT value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).

### **Area Carrying Capacity (CC)**

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.

### **The Results of Internal Factor Strategic Analysis Summary (IFAS) and External Factor Strategic Analysis Summary (EFAS)**

The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which demands serious attention from the manager.

The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained

by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.

It was also identified that the highest weakness factor is the inadequate supporting facilities and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community.

The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. IE Matrix

***TOTAL SCORE OF INTERNAL FACTORS***

	STRONG 4,0	AVERAGE 3,0	WEAK 2,0	1,0
HIGH 3,0	I Growth Concentration through Vertical Integration	<b>II Growth Concentration through Horizontal Integration</b>	III Retrenchment Turn Around	
AVERAGE 2,0	IV Stability Carefulness	V Growth Concentration though Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment	
WEAK 1,0				



VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation
---------------------------------------------	------------------------------------------------	-----------------------------------------------

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
- d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated by Pons and Fiselier (1991) and suitable with blue economy (Lee et al., 2020).
- e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

Based on the results of research and analysis of internal and external factors of mangrove eco-tourism development in Nusa Penida island, some conclusions can be formulated as follows:

1. The potential of mangrove eco-tourism area:

- a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as an eco-tourism site.
  - b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate tourists are 360 people for 8 hours each day.
2. The Main Strategies for mangrove eco-tourism development which can be done are presented in the following part:
    - a. Cooperating with all stakeholders related to mangrove eco-tourism development including doing promotion.
    - b. Inviting investors for the development of mangrove eco-tourism.
    - c. Increasing the types of services for tourists such as improving supporting facilities for eco-tourism activities.
    - d. Creating design plan and regulation of mangrove eco-tourism management.
    - e. Monitoring the tourist activities and implementing conservation-based tourist activities.

## Recommendations

1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K ( $\Sigma$ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Table 4. Internal External Matrix

**TOTAL SCORE OF INTERNAL FACTORS**

	STRONG 4,0	AVERAGE 3,0	WEAK 2,0	1,0
HIGH 3,0	I Growth Concentration through Vertical Integration	II Growth Concentration through Horizontal Integration	III Retrenchment Turn Around	
AVERAGE 2,0	IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment	
WEAK 1,0	VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation	

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4 **MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA**  
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6 **SACRED ISLAND IN BALI, INDONESIA**  
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28 **ABSTRACT**  
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32 Nusa Penida Island is one of the most famous island in Bali Province has a big potential for eco-  
33 tourism development according to the data of foreign tourists visiting Nusa Penida district which is  
34 about more than 200,000 people per year. In the other side, Nusa Penida island have an important  
35 function as a buffer zone area of Bali Island. The study was conducted to assess the potential of  
36 mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was  
37 assessed by calculating the tourist suitability index and carrying capacity of mangrove forest  
38 tracking path for mangrove tour. Some development strategies were analyzed by using SWOT  
39 analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that  
40 the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site  
41 with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total  
42 IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs  
43 in second quadrant. Some strategies of eco-tourism development in this mangrove forest are  
44 cooperating with all related stakeholders, inviting investors, improving types of tourist services such  
45 as improving all supporting facilities for eco-tourism activities, increasing the number of tourist  
46 attractions, designing plans and regulations of eco-tourism mangrove management, promoting this  
47 place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist  
48 activities. However, the main strategy to restore mangrove as an ecotourism destination is  
49 improving tourist infrastructure.  
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52 Keywords: Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis  
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55 **INTRODUCTION**  
56

57 According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest  
58 which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest  
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4 biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest  
5 locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically  
6 concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an unspoiled  
7 natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office of  
8 Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site. Based  
9 on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting Nusa Penida  
10 reached 200,000 people per year. Considering this big number, opportunities for the development  
11 of mangrove eco-tourism in Nusa Penida island should be taken.  
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16 The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-  
17 organized. Facilities and infrastructures supporting eco-tourism activities themselves have not  
18 adequate. Moreover, information center which give recent condition of mangrove forest has not yet  
19 available.  
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22 This research examined the potential of mangrove forests in Nusa Penida as a sacred and famous  
23 tourist area regarding its sustainability and feasibility or suitability to be developed as an eco-tourism  
24 site. Furthermore, development strategies which needs to be considered are also presented in this  
25 study.  
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## 29 **LITERATURE REVIEW**

### 30 **Blue Economy (BE)**

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33 The effort for safeguarding the world oceans, water resources and coastal area are in line with  
34 the blue economy concept. This concept emphasizes the balance of community activities in long  
35 term planning (Lee, Noh, & Khim, 2020). As a small island with abundant natural resources and  
36 uniqueness of culture, its regional development program must be sustainable an improve welfare  
37 community.  
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### 43 **Development Strategies**

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45 According Rangkuti (2006), a strategy is a comprehensive master planning which explains how  
46 to achieve the predetermined goals. Strategies in the development of tourism are classified as  
47 activities to seek conformity between internal forces (strengths and weaknesses) and external forces  
48 (opportunities and threats).  
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### 51 **Mangrove**

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53 Mangrove forest is a tropical beach vegetation community, dominated by several types of  
54 mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen,  
55 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and  
56 sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta, and estuaries.  
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### 59 **Mangrove Density**

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Density is the number of trees per unit area. The density of mangrove forest is one of indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove forest is used as a parameter in determining whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007).

### **Thickness Level of Mangrove Forests**

Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer line or the area which directly surrounded by sea water to mainland or association area. Findings of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).

### **The Potential of Mangrove Forest for Eco-tourism**

Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism activities which can be developed are tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply considering economic benefits which can be obtained without exploiting the mangrove itself (Kusmana and Istomo, 1993).

### **Ecological Suitability of Mangrove for Eco-tourism**

Eco-tourism activities planning should be tailored to the potential of natural resources and their allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1), appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and (5) biota.

### **Carrying Capacity of the Area**

Environmental carrying capacity refers to the capacity or ability of an ecosystem to support healthy organism life while maintain productivity, adaptability, and ability to renew itself. According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors which can be physically accommodated by the area provided at a certain time without causing disruption to both nature and humans.

### **Eco-tourism**

Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to enjoy the beauty of scenery and promote some elements of education in order to understand and support the environmental conservation efforts and the involvement of local communities in the eco-tourism destination areas for its management (Arida, 2016).



Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco tourism is used to describe trips to remote natural location for the purpose of enjoying and learning the nature and culture of local population. In 1996, Ceballos-Lascurain added the use environmentally friendly technology concepts in explaining ecotourism development.

### Local Community Participation

In the development of an eco-tourism site, support and participation from the local community is obviously needed. This idea is in line with the concept of tourism development where eco-tourism development should rely on the development of local communities. A form of eco-tourism management needs to consider is community-based natural resource management. In its implementation, the community is involved starts from planning to supervision stage (Tahir and Baharudin, 2002).

## RESEARCH METHODS

### Research Location and Timetable

The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research



object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist. The study has been conducted for 12 months, starting from November 2017 to October 2018. The interview process was done at Nusa Penida Island.

Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
----	-----------	--------	----------	-------	----------	-------	----------	-------	----------	-------

			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N \max} \right] x 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K \times \frac{Lp}{Lt} \times \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

Lt = Area unit for certain category (m<sup>2</sup> or m)

Wt = Time provided by the region for tourism activities in one day (hours)

Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K (∑ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

### Analysis of Development Strategies for Mangrove Eco-tourism

The technique used to create development strategy for mangrove eco-tourism was SWOT analysis. This analysis is a systematic identification of strategic factors to formulate a strategy (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths, weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal and external factors.

- a. Analysis of internal factors (strengths and weaknesses);
- b. Analysis of external factors (opportunities and threats);
- c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are principally grouped into three main categories, namely: a). Growth Strategy or growth of the activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and 8); b). Stability Strategy or a strategy which is implemented without changing the direction of the predetermined strategy (cells #4 and 5);
- c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).

## **FINDINGS AND DISCUSSION**

### **General Condition of the Researched Area**

Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### **Conformity of Mangrove Eco-tourism (CIT)**

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9 with CIT value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).

### Area Carrying Capacity (CC)

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.

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4 **The Results of Internal Factor Strategic Analysis Summary (IFAS) and**  
5 **External Factor Strategic Analysis Summary (EFAS)**  
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7 The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed  
8 as an eco-tourism site, yet there are also various weaknesses or problems and threats in the  
9 implementation which demands serious attention from the manager.

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11 The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of  
12 mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained  
13 by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33.  
14 It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and  
15 existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.  
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19 It was also identified that the highest weakness factor is the inadequate supporting facilities and  
20 infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing  
21 weakness factors, supporting facilities and infrastructures are perceived to have the least  
22 disadvantage.  
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25 The results of External Factor Analysis Summary (EFAS) which consist of opportunities and  
26 threat factors of mangrove eco-tourism development discover that the highest probability factor is  
27 the opening of new job alternative to increase the income of local community and the festival of  
28 Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of  
29 mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive  
30 impact the income of local community.  
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33 The threat factor which gains the highest score is competition with other attractions with a score  
34 of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with  
35 other tourism objects in Bali.  
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38 From the results of internal environmental factor analysis, it was found that the development of  
39 mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the  
40 external factor analysis is in the "High" position with an average score of 3.09. The merger of these  
41 two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).  
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47 Table 4. IE Matrix

48 **TOTAL SCORE OF INTERNAL FACTORS**

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		STRONG	AVERAGE	WEAK	
		4,0	3,0	2,0	1,0
HIGH	3,0	I Growth Concentration through Vertical Integration	II Growth Concentration through Horizontal Integration	III Retrenchment Turn Around	
	AVERAGE				
	2,0				
	WEAK				

65

IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment
VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
- d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated by Pons and Fiselier (1991) and suitable with blue economy (Lee et al., 2020).
- e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## CONCLUSIONS AND RECOMMENDATIONS

## Conclusions

Based on the results of research and analysis of internal and external factors of mangrove eco-tourism development in Nusa Penida island, some conclusions can be formulated as follows:

1. The potential of mangrove eco-tourism area:
  - a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as an eco-tourism site.
  - b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate tourists are 360 people for 8 hours each day.
2. The Main Strategies for mangrove eco-tourism development which can be done are presented in the following part:
  - a. Cooperating with all stakeholders related to mangrove eco-tourism development including doing promotion.
  - b. Inviting investors for the development of mangrove eco-tourism.
  - c. Increasing the types of services for tourists such as improving supporting facilities for eco-tourism activities.
  - d. Creating design plan and regulation of mangrove eco-tourism management.
  - e. Monitoring the tourist activities and implementing conservation-based tourist activities.

## Recommendations

1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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**Date:** 10 Jun 2022  
**To:** "Utari Vipriyanti" mangtiutari@yahoo.com  
**From:** "Environment, Development and Sustainability (ENVI)"  
aishwarya.ramasamy@springer.com  
**Subject:** Major Revisions requested ENVI-D-19-00627R3

Dear Dr Vipriyanti,

We have received the reports from our advisors on your manuscript, "DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA", which you submitted to Environment, Development and Sustainability.

Based on the advice received, I feel that your manuscript could be reconsidered for publication should you be prepared to incorporate major revisions.

When preparing your revised manuscript, you are asked to carefully consider the reviewer comments which are attached, and submit a list of responses to the comments. You are also requested to highlight the changes made on the revised manuscript.

YOU ARE KINDLY REQUESTED TO ALSO CHECK THE WEBSITE FOR POSSIBLE REVIEWER ATTACHMENTS.

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We look forward to receiving your revised manuscript before 12 Aug 2022

With kind regards,  
Luc Hens  
Editor in Chief  
Environment, Development and Sustainability

#### COMMENTS TO THE AUTHOR:

Reviewer #1: The author does not explain and elaborate more deeply on each finding (tables/figures) by confirming similar studies/library review. Thus, the author does not get a complete picture of the purpose of his research.

Authors need to adopt more reading material, add references, elaborate, in order to produce enrichment of theoretical concepts and implementation of their research

The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal

Reviewer #4:

You should do all comments one by one. I can't find your response (all answers must be highlighted

on body manuscript). If you couldn't do any comments, We will reject your article.  
back to ENVI-D-19-00627R2.

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## **Authors' response to reviewers' comments**

Dear all reviewers,

Thank you for giving us the opportunity to submit a revised draft of our manuscript titled "DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA" to the International Journal of Environment, Development and Sustainability. We really appreciate the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

### **Response to Reviewer #3**

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section.

#### **Reviewer #1:**

The author does not explain and elaborate more deeply on each finding (tables/figures) by confirming similar studies/library review. Thus, the author does not get a complete picture of the purpose of his research.

Authors need to adopt more reading material, add references, elaborate, in order to produce enrichment of theoretical concepts and implementation of their research

The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal

#### **Response #1:**

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'response' section. We describe one by one to response every comment, become as follows:

*"The effort for developing mangrove area to be sustainable tourism should optimize natural resources use and respect the sociocultural characteristics of local communities. This result was supported by former research result that stated some mangrove area suitable to be ecotourism destinationa (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021) (page 9).*

*Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. Recently, the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. This number of person below the capacity of Lembar mangrove ecotourism in Lombok Island which reached 2337 people per day (Sukuryadi, Harahab, Primyastanto, & Semedi, 2020). On the other side, the limited capacity of Nusa Penida due to the topography and it sacredness. Unfortunately, in pick season, as of July to September, the number of visits increased sharply until 400 tourists per day. This condition should get serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another*

*activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in this island (page 9).*

*Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated that sustainable mangrove ecotourism should be based on local wisdom and designated by appropriate regulation and policies (Syafri Harto, 2021) and suitable with blue economy principle (Lee et al., 2020) (page 11)".*

**Comment #2:**

The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal

**Response #2:**

We agree with this and have incorporated your suggestion throughout the manuscript. We have, accordingly, revised and put some detailed explanations Please find some improvement in our manuscript onpage 9-11.

*"The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which need serious attention from the manager. The suitable strategy should develop based on existing condition involving elements of strengths, weaknesses, opportunities and threats. In addition, the right strategy can avoid damage to natural and institutional resources".*

# Environment, Development and Sustainability

## DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA

--Manuscript Draft--

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<b>Abstract:</b>	<p>One of the famous tourism sites in Bali Province Indonesia is Nusa Penida island. Located in the eastern part of the Bali, the small island is very famous tourist destination attracting more than two hundred thousand people per year. Nusa Penida, however, is not only designated as tourist destination but also designated as conservation buffer zone for the island of Bali. Therefore, balancing economic benefits of tourism and conservation function of the island is a challenging issue in the tourism management of the small island. This study attempts to address such an issue by analyzing the potential of mangrove forest in the island as sacred ecotourism destination. The tourist suitability index and carrying capacity of mangrove forest were carried to assess the potential development of the area. In addition, SWOT analysis was conducted to analysis development strategies of the ecotourism in the area. The results showed that Tourist Suitability Index (TSI) is 74.36 percent, implying that the mangrove forest area in Nusa Penida Island is suitable to be developed as an eco-tourism site. The carrying capacity of the r mangrove tour route is calculated at 360 tourist per day. Based on SWOT analysis, the average of total IFAS and EFAS analysis score is 2.89 and 3.09 respectively, with internal external matrix is within the second quadrant of SWOT matrix. Several strategies recommendation are proposed. These include improving tourist infrastructure, stakeholder cooperation, improving tourist services, promoting nusa penida sacred ecotourism to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities.</p>
<b>Response to Reviewers:</b>	I have revised the abstract and put some novelty on introduction. Revision have been made also in conclusion and recommendation. I have added some reference to make this article more complete. Thank you.

**DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND,  
BALI, INDONESIA**

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4 **DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA**  
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11 **ABSTRACT**  
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14 One of the famous tourism sites in Bali Province Indonesia is Nusa Penida island. Located in the  
15 eastern part of the Bali, the small island is very famous tourist destination attracting more than two  
16 hundred thousand people per year. Nusa Penida, however, is not only designated as tourist  
17 destination but also designated as conservation buffer zone for the island of Bali. Therefore,  
18 balancing economic benefits of tourism and conservation function of the island is a challenging issue  
19 in the tourism management of the small island. This study attempts to address such an issue by  
20 analyzing the potential of mangrove forest in the island as sacred ecotourism destination. The tourist  
21 suitability index and carrying capacity of mangrove forest were carried to assess the potential  
22 development of the area. In addition, SWOT analysis was conducted to analysis development  
23 strategies of the ecotourism in the area. The results showed that Tourist Suitability Index (TSI) is  
24 74.36 percent, implying that the mangrove forest area in Nusa Penida Island is suitable to be  
25 developed as an eco-tourism site. The carrying capacity of the r mangrove tour route is calculated  
26 at 360 tourist per day. Based on SWOT analysis, the average of total IFAS and EFAS analysis score  
27 is 2.89 and 3.09 respectively, with internal external matrix is within the second quadrant of SWOT  
28 matrix. Several strategies recommendation are proposed. These include improving tourist  
29 infrastructure, stakeholder cooperation, improving tourist services, promoting nusa penida sacred  
30 ecotourism to public and tourists, supervising tourist activities, and carrying out conservation-based  
31 tourist activities.  
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34 **Keywords:** Mangrove Eco Tourism; Sacred Island; SWOT analysis; Tourist Suitability Index  
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37 **INTRODUCTION**  
38

39 Mangrove forests, especially those in the tropical countries, play an important role both in  
40 terms of ecological function they provided and source of livelihood for coastal communities  
41 whereby millions of people depend on them. In terms of ecological function, mangrove forests  
42 provide coastal protection, enhance coastal fisheries productivities, source of carbon sink, as well as  
43 nutrient cycle. As for their economic role, mangrove provide source of raw materials such as  
44 firewood, food and construction materials (Richards and Friess, 2016., Cannici et al, 2008). In  
45 addition, mangrove ecosystem also provide social and cultural values in the form of recreational  
46 uses (Giri et al, 2011).  
47

48 Despite their critical role both ecologically and economically, mangroves forests, especially in  
49 southeast Asia, have been experiencing extensive deforestation due to increase in demand for  
50 aquaculture and other land conversion for different purposes. Richards and Friess (2016) estimated  
51 that during period of 2000-2012, mangrove forests in Southeast Asia were lost at an average of 0.18%  
52 per year with aquaculture accounting for 30% of this total forest change. In response to such a  
53 problem, government in many developing countries have developed various measures to protect  
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3 mangrove forests such as mangrove conservation, establishing marine protected areas, or  
4 designating mangrove forests as ecotourism areas. Such a measure has been implemented in Nusa  
5 Penida mangrove forest in Bali Indonesia.  
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8 Nusa Penida island in Bali Province has been designated as Marine Protected Area by local  
9 Klungkung regency in 2010 (Daulat et al 2018). The measure was supported by the Ministry of  
10 Fisheries and Marine affairs as an effort to protect mangrove forest in the area from anthropogenic  
11 pressures and other source of mangrove degradation. Mangrove forest in this island is mostly  
12 concentrated in Jungutbatu Village of Nusa Penida islands covering an area of 194 hectares. The  
13 mangrove forest is known for its pristine environment and attract tourists to visit the area. Based on  
14 survey conducted by Tania and Muljadi (2011), the number of foreign tourists visiting Nusa Penida  
15 reached 200,000 people per year. This provide an opportunity to develop and manage the mangrove  
16 area as eco-tourism area, so that the conservation and economic purposes of the mangrove  
17 management could be achieved.  
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20 One of the challenging issues of managing mangrove ecotourism, however, is how to develop  
21 a comprehensive assessment strategy to develop mangrove as tourism destination. Up until now,  
22 such a management is lacking. The institutional arrangement of the ecotourism has net been  
23 developed yet. In addition, analysis of carrying capacity, which is essential for mangrove  
24 ecotourism, is not yet available.  
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27 Considering these issues, this study attempts to fill the gaps, by developing sustainable  
28 strategies for mangrove ecotourism management in Nusa Penida sacred island. By doing so, this  
29 study begins with determining carrying capacity of the mangrove ecotourism, as well as the  
30 ecological suitability of the mangrove ecosystem for tourism. The results of the study could be used  
31 as policy guidelines for local government in managing ecotourism in sacred island of Nusa Penida  
32 Bali, as well as other similar ecotourism management elsewhere.  
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## 42 **LITERATURE REVIEW**

### 43 44 45 **Blue Economy (BE)**

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47 As a small island with abundant natural resources and uniqueness of culture, regional  
48 development program in Nusa Penida island must be sustainable to improve people's welfare. The  
49 effort for protect the land, oceans, water resources and coastal area must be in line with the blue  
50 economy concept. This concept emphasizes the balance of community activities in long term  
51 planning. One of the studies related to the blue economy using scenario analysis is shown in the  
52 study related to the impact of land use using the CLUE's model. This method has proven to be a  
53 usefull tool (Lee, Noh, & Khim, 2020).  
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## **Development Strategies**

According Rangkuti (2006), a strategy is a comprehensive master planning which explains how to achieve the predetermined goals. Strategies in the development of tourism are classified as activities to seek conformity between internal forces (strengths and weaknesses) and external forces (opportunities and threats). Although this method relatively simple, it can provide initial information regarding strategy that must be formulated in remote area.

## **Mangrove**

Mangrove forest is a tropical beach vegetation community, dominated by several types of mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen, 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta, and estuaries.

## **Mangrove Density**

Density is the number of trees per unit area. The density of mangrove forest is one of indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove forest is used as a parameter in determining whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007).

## **Thickness Level of Mangrove Forests**

Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer line or the area which directly surrounded by sea water to mainland or association area. Findings of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).

## **The Potential of Mangrove Forest for Eco-tourism**

Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism activities which can be developed are tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply considering economic benefits which can be obtained without exploiting the mangrove itself (Kusmana and Istomo, 1993).

## **Ecological Suitability of Mangrove for Eco-tourism**

Eco-tourism activities planning should be tailored to the potential of natural resources and their allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1),

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2  
3 appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five  
4 assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters  
5 are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and  
6 (5) biota.  
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## 10 11 **Carrying Capacity of the Area**

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13 Environmental carrying capacity refers to the capacity or ability of an ecosystem to support  
14 healthy organism life while maintain productivity, adaptability, and ability to renew itself.  
15 According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors  
16 which can be physically accommodated by the area provided at a certain time without causing  
17 disruption to both nature and humans.  
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## 21 22 **Eco-tourism**

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24 Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to  
25 enjoy the beauty of scenery and promote some elements of education in order to understand and  
26 support the environmental conservation efforts and the involvement of local communities in the eco-  
27 tourism destination areas for its management (Arida, 2016).  
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30  
31 Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco  
32 tourism is used to describe trips to remote natural location for the purpose of enjoying and learning  
33 the nature and culture of local population. In 1996, Ceballos-Lascurain added the use  
34 environmentally friendly technology concepts in explaining ecotourism development.  
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## 38 39 **Local Community Participation**

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41 In the development of an eco-tourism site, support and participation from the local community  
42 is obviously needed. This idea is in line with the concept of tourism development where eco-tourism  
43 development should rely on the development of local communities. A form of eco-tourism  
44 management needs to consider is community-based natural resource management. In its  
45 implementation, the community is involved starts from planning to supervision stage (Tahir and  
46 Baharudin, 2002).  
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## 50 51 **RESEARCH METHODS**

### 52 53 **Research Location and Timetable**

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The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research



object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist who lived while the research was carried out. The study has been conducted for 12 months, starting from November 2017 to October 2018. The

interview process was done at Nusa Penida Island. Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N \max} \right] x 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K x \frac{Lp}{Lt} x \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

Lt = Area unit for certain category (m<sup>2</sup> or m)

Wt = Time provided by the region for tourism activities in one day (hours)

Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K (Σ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

## **Analysis of Development Strategies for Mangrove Eco-tourism**

The technique used to create development strategy for mangrove eco-tourism was SWOT analysis. This analysis is a systematic identification of strategic factors to formulate a strategy (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths, weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal and external factors.

- a. Analysis of internal factors (strengths and weaknesses);
- b. Analysis of external factors (opportunities and threats);
- c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are principally grouped into three main categories, namely: a). Growth Strategy or growth of the activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and 8); b). Stability Strategy or a strategy which is implemented without changing the direction of the predetermined strategy (cells #4 and 5);
- c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).

## **FINDINGS AND DISCUSSION**

### **General Condition of the Researched Area**

Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or

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3 diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-  
4 2020).  
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### 8 **Conformity of Mangrove Eco-tourism (CIT)**

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10 Before developing mangrove area as a tourism site, potential resources and their allocation  
11 should be measured and identified in advance. The Conformity Index for Tourism is identifiable in  
12 the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable  
13 (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of  
14 mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types,  
15 mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the  
16 research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.  
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23 Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village  
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No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

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47 Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has  
48 a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9 with CIT  
49 value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove  
50 density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with  
51 the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the  
52 category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After  
53 the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa  
54 Penida Island is in the category of Appropriate/S2 (50 - <80%).  
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### **Area Carrying Capacity (CC)**

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.

### **The Results of Internal Factor Strategic Analysis Summary (IFAS) and External Factor Strategic Analysis Summary (EFAS)**

The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which demands serious attention from the manager.

The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.

It was also identified that the highest weakness factor is the inadequate supporting facilities and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community.



The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. Internal External Matrix  
**TOTAL SCORE OF INTERNAL FACTORS**

		STRONG	AVERAGE	WEAK	
		4,0	3,0	2,0	1,0
HIGH	3,0	I Growth Concentration through Vertical Integration	II Growth Concentration through Horizontal Integration	III Retrenchment Turn Around	
	AVERAGE	2,0	IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment
WEAK	1,0	VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation	

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading

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3 environmentally infrastructure in coastal area inline with mangrove restoration. These program  
4 making coastal communities more safe and suitable with IUCN (2017).

- 5  
6 c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove  
7 eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching  
8 towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.  
9  
10 d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of  
11 mangrove eco-tourism management and making regulations about mangrove eco-tourism  
12 management as well as stated by Pons and Fiselier (1991) and suitable with blue economy (Lee  
13 et al., 2020).  
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15 e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying  
16 capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist  
17 activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas,  
18 and planting the mangrove areas that have less density.  
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## 25 **CONCLUSIONS AND RECOMMENDATIONS**

### 26 **Conclusions**

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28 Developing mangrove forest as an ecotourism area could not only help to reduce degradation  
29 of forest ecosystem, but also could improve social and economic condition for the communities  
30 through the improvement in income and improvement of general well-being from ecosystem  
31 services derived from mangrove forest. This study shows that development of ecotourism in Nusa  
32 Penida is feasible shown by the suitability index and carrying capacity of the forest area to  
33 accommodate more than 350 people per day.  
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37 To achieve sustainable ecotourism strategies of Nusa Penida island, stakeholder engagement  
38 is factor that need to be strengthen along with continuing promotion of the ecotourism and inviting  
39 investors. In addition, the type of tourist services both in terms of variation of services and quality  
40 of services, as well as public infrastructure that support ecotourism in the area need to be improved.  
41 The results of this study also indicate that creating better design plan and regulation of mangrove  
42 eco-tourism management and improvement in monitoring the tourist activities and implementing  
43 conservation-based tourist activities are factors that need to be considered for sustainable ecotourism  
44 in the area.  
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### 51 **Recommendations**

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53 Mangrove ecotourism is derived its benefit from the continuing services from nature.  
54 Therefore, it is recommended that assessment of potential fauna that attract more tourists in the area  
55 is needed. It is also important to consider that human resources are paramount factors for sustainable  
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3 ecotourism. Therefore, investment in human resources to support ecotourism and to improve social-  
4 economic condition in other tourism related sectors is highly recommended.  
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Date: 03 Sep 2022  
To: "Utari Vipriyanti" mangtiutari@yahoo.com  
From: "Environment, Development and Sustainability (ENVI)"  
aishwarya.ramasamy@springer.com  
Subject: Your Submission ENVI-D-19-00627R4

Dear Dr Vipriyanti,

We have received the reports from our advisors on your manuscript, "DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA", submitted to Environment, Development and Sustainability

Based on the advice received, I have decided that your manuscript can be accepted for publication after you have carried out the corrections as suggested by the reviewer(s). You are also requested to highlight the changes made on the revised manuscript.

Attached, please find the reviewers' comments for your perusal.

**YOU ARE KINDLY REQUESTED TO ALSO CHECK THE WEBSITE FOR POSSIBLE REVIEWER ATTACHMENTS.**

Please note: When uploading your revised files, please make sure only to submit your editable source files (i. E. Word, tex).

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I am looking forward to receiving your revised manuscript before 07 Nov 2022

Thank you.

With kind regards,  
Luc Hens  
Editor in Chief

## Environment, Development and Sustainability

### COMMENTS TO THE AUTHOR:

Reviewer #4: Chapter numbering does not follow the journal style.

Check if you have included enough details on statistics (number of replicates, statistical tests performed, presentation of average and standard deviation or error values, both in tables and graphs), and complete it if needed.

What are the original, novelty, or unique ideas behind this research as compared to previous research/other reported work? Why it is worth knowing?

The logic of the current introduction should be revised, objectives of this study need to be changed.

Graphic quality of many figures does not satisfy with publication standard. Provide the maps in high dpi resolution.

More articles should be discussed, especially among the international literature.

<https://doi.org/10.1007/s40808-016-0258-8>, <https://doi.org/10.1007/s41324-017-0086-6>,  
<https://doi.org/10.1177/11786221221086285>, <https://doi.org/10.3390/rs14133227>

etc

where is title fig1?

Reviewer #5: I appreciate the efforts of all reviewers for their valuable comments which helped a lot to improve this paper. I am also appreciating the efforts done by author/authors to incorporate the comments of all reviewers. However, there are following some points that need to be incorporated in this study:

1. The author needs to include some empirical evidence (facts and figures) in introduction section to support and justify the issue of this study.
2. Motivation towards the topic/issue is not enough. The study needs to embrace more theoretical evidences in introduction section to elaborate the statement of the problem.
3. Mention the source of the methodology used in table 1.
4. The methodologies and their constructed values in table 1 and 2 need more explanations/interpretations.

Reviewer #6: This study investigates the tourist suitability index and carrying capacity to assess the potential of the mangrove forest on Nusa Penida Island. With a few revision, this study deserves publication.

### Comments:

\* "Based on survey conducted by Tania and Muljadi (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year."

Is there any more recent data? If this is the most recent data, it should be highlighted in the text.

\* Errors in references should be fixed:

"This result was supported by former research result that stated some mangrove area suitable to be ecotourism destination (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021)."

"There are numerous activities which can be developed in mangrove ecotourism area such tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014; Hu et al., 2020; )."

\* In the conclusion section, the innovative aspect and limitations of this study should be mentioned.

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## **Authors' response to reviewers' comments**

Dear Editor in Chief and all reviewers,

Thank you for giving us opportunity to submit a revised draft of our manuscript and also for a good news that this article will be accepted after minor revision. We deliver big appreciation for the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

### **Response to Reviewer #4:**

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section

#### **Comment#1:**

Chapter numbering does not follow the journal style. Check if you have included enough details on statistics (number of replicates, statistical tests performed, presentation of average and standard deviation or error values, both in tables and graphs), and complete it if needed.

#### **Response #1:**

Thank you for reminding this important thing. We agree with this comment and we have adapted the guidance for author and hope nothing is missed. There is no numbering in chapter.

#### **Comment #2:**

What are the original, novelty, or unique ideas behind this research as compared to previous research/other reported work? Why it is worth knowing?

#### **Response #2:**

The originality of this research lies in complexity of problem solving that using quantitative and qualitative method to determine the suitability of mangrove forest area to be tourism destination, carrying capacity and appropriate strategy.

The novelty of this study lies in the implementation of mixed method by combining conformity index for tourism, carrying capacity and SWOT. This is the first research on related issues in Nusa Penida.

The uniqueness is the development of tourism on sacred island and how to develop a comprehensive assessment strategy to develop mangrove as tourism destination.

#### **Comment #3:**

The logic of the current introduction should be revised, objectives of this study need to be changed.

#### **Response #3:**

We agree with this and have incorporated your suggestion throughout the manuscript. Please find some improvement in our manuscript on paragraph 4<sup>th</sup>, line 4-8 and paragraph 5<sup>th</sup>.

“In addition, analysis of carrying capacity, which is essential for mangrove ecotourism, is not sufficiently available. The last study related to carrying capacity of this area was carried out using data from 2012-2013 (Bato et al., 2013). In 2020, only research on environmental management models is available in this island without carrying capacity analysis and also not formulating a mangrove forest management strategy as a tourism destination (Sudipa, et al, 2020).”

“Considering these issues, this study attempts to fill the gaps, by developing sustainable strategies for mangrove ecotourism management in Nusa Penida sacred island. By doing so, this study begins with determining carrying capacity of the mangrove ecotourism, as well as the ecological suitability of the mangrove ecosystem for tourism. The results of the study could be used as policy guidelines for local government in managing ecotourism in sacred island of Nusa Penida Bali, as well as other similar ecotourism management elsewhere.”

#### **Comment #4:**

where is title fig1?

“Considering these issues, this study attempts to fill the gaps, by developing sustainable strategies for mangrove ecotourism management in Nusa Penida sacred island. By doing so, this study begins with determining carrying capacity of the mangrove ecotourism, as well as the ecological suitability of the mangrove ecosystem for tourism. The results of the study could be used as policy guidelines for local government in managing ecotourism in sacred island of Nusa Penida Bali, as well as other similar ecotourism management elsewhere.”

Comment #4:

where is title fig1?

Response #4:

I do apologized for missing the title and thank your for your comment. Therefore, as suggested by the reviewer, we have revised and put title on the figure 1.

## **Authors' response to reviewers' comments**

Dear all reviewers,

Thank you for giving us the opportunity to submit a revised draft of our manuscript titled “DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA ” to the International Journal of Environment, Development and Sustainability. We really appreciate the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

### **Response to Reviewer #4**

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section.

Reviewer #4:

You should do all comments one by one. I can't find your response (all answers must be highlighted on body manuscript). If you couldn't do any comments, We will reject your article. back to ENVI-D-19-00627R2.

### **Response #1:**

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'response' section. We describe one by one to response every comment from reviewer such as comment from reviewer and have highlighted, become as follows:

*“The effort for developing mangrove area to be sustainable tourism should optimize natural resources use and respect the sociocultural characteristics of local communities. This result was supported by former research result that stated some mangrove area suitable to be ecotourism destinationa (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021) (page 9).*

*Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. Recently, the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. This number of person below the capacity of Lembar mangrove ecotourism in Lombok Island which reached 2337 people per day (Sukuryadi, Harahab, Primyastanto, & Semedi, 2020). On the other side, the limited capacity of Nusa Penida due to the topography and its sacredness. Unfortunately, in peak season, as of July to September, the number of visits increased sharply until 400 tourists per day. This condition should get serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in this island (page 9).*

*Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated that sustainable mangrove ecotourism should be based on local wisdom and designated by appropriate regulation and policies (Syafri Harto, 2021) and suitable with blue economy principle (Lee et al., 2020) (page 11)”.*

### **Comment #2:**

The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal

### **Response #2:**

We agree with this and have incorporated your suggestion throughout the manuscript. We

**Response #2:**

We agree with this and have incorporated your suggestion throughout the manuscript. We have, accordingly, revised and put some detailed explanations Please find some improvement in our manuscript onpage 9-11.

*“The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which need serious attention from the manager. The suitable strategy should develop based on existing condition involving elements of strengths, weaknesses, opportunities and threats. In addition, the right strategy can avoid damage to natural and institutional resources”.*

**From:** Environment, Development and Sustainability (ENVI) em@editorialmanager.com  
**Subject:** ENVI-D-19-00627R4- Submission Confirmation  
**Date:** 17 July 2022 10.01  
**To:** Utari Vipriyanti mangtiutari@yahoo.com



Dear Dr Vipriyanti,

We acknowledge, with thanks, receipt of the revised version of your manuscript, "DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA", submitted to Environment, Development and Sustainability  
The manuscript number is ENVI-D-19-00627R4.

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# Environment, Development and Sustainability

## DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA

--Manuscript Draft--

<b>Manuscript Number:</b>	ENVI-D-19-00627R4
<b>Full Title:</b>	DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA
<b>Article Type:</b>	Original paper
<b>Keywords:</b>	Mangrove Eco Tourism; Sacred Island; SWOT analysis; Tourist Suitability Index
<b>Corresponding Author:</b>	Utari Vipriyanti, PhD Universitas Mahasaraswati Denpasar denpasar, Bali INDONESIA
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<b>First Author:</b>	Utari Vipriyanti, PhD
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<b>Order of Authors Secondary Information:</b>	
<b>Funding Information:</b>	
<b>Abstract:</b>	<p>One of the famous tourism sites in Bali Province Indonesia is Nusa Penida island. Located in the eastern part of the Bali, the small island is very famous tourist destination attracting more than two hundred thousand people per year. Nusa Penida, however, is not only designated as tourist destination but also designated as conservation buffer zone for the island of Bali. Therefore, balancing economic benefits of tourism and conservation function of the island is a challenging issue in the tourism management of the small island. This study attempts to address such an issue by analyzing the potential of mangrove forest in the island as sacred ecotourism destination. The tourist suitability index and carrying capacity of mangrove forest were carried to assess the potential development of the area. In addition, SWOT analysis was conducted to analysis development strategies of the ecotourism in the area. The results showed that Tourist Suitability Index (TSI) is 74.36 percent, implying that the mangrove forest area in Nusa Penida Island is suitable to be developed as an eco-tourism site. The carrying capacity of the r mangrove tour route is calculated at 360 tourist per day. Based on SWOT analysis, the average of total IFAS and EFAS analysis score is 2.89 and 3.09 respectively, with internal external matrix is witin the second quadrant of SWOT matrix. Several strategies recommenation are proposed. These include improving tourist infratsructure, stakeholder cooperation, improving tourist services, promoting nusa penida sacred ecotourism to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities.</p>
<b>Response to Reviewers:</b>	<p>Response to Reviewer #1 We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section.</p> <p>Reviewer #1: The author does not explain and elaborate more deeply on each finding (tables/figures) by confirming similar studies/library review. Thus, the author does not get a complete picture of the purpose of his research.</p>

Authors need to adopt more reading material, add references, elaborate, in order to produce enrichment of theoretical concepts and implementation of their research. The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal.

Response #1:

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'response' section. We describe one by one to response every comment, become as follows:

"The effort for developing mangrove area to be sustainable tourism should optimize natural resources use and respect the sociocultural characteristics of local communities. This result was supported by former research result that stated some mangrove area suitable to be ecotourism destinationa (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021) (page 9). Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. Recently, the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. This number of person below the capacity of Lembar mangrove ecotourism in Lombok Island which reached 2337 people per day (Sukuryadi, Harahab, Primyastanto, & Semedi, 2020). On the other side, the limited capacity of Nusa Penida due to the topography and its sacredness. Unfortunately, in peak season, as of July to September, the number of visits increased sharply until 400 tourists per day. This condition should get serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in this island (page 9). Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated that sustainable mangrove ecotourism should be based on local wisdom and designated by appropriate regulation and policies (Syafri Harto, 2021) and suitable with blue economy principle (Lee et al., 2020) (page 11)".

Reviewer #4:

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back to ENVI-D-19-00627R2.

Response #1:

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'response' section. We describe one by one to response every comment from reviewer such as comment from reviewer and have been highlighted in the body text as below:

Page 1, 2, 8, 9, and 11. Some reference have been added, too.



**DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND,  
BALI, INDONESIA**

Nyoman Utari Vipriyanti\*; I Gusti Ngurah Made Dharma Semadi\*\*;  
Ahkmad Fauzi\*\*\*

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\*\*\*Professor on Natural Resource Management at Bogor Agriculture University

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4 **DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA**  
5 **SACRED ISLAND, BALI, INDONESIA**  
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11 **ABSTRACT**  
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14 One of the famous tourism sites in Bali Province Indonesia is Nusa Penida island. Located in the  
15 eastern part of the Bali, the small island is very famous tourist destination attracting more than two  
16 hundred thousand people per year. Nusa Penida, however, is not only designated as tourist  
17 destination but also designated as conservation buffer zone for the island of Bali. Therefore,  
18 balancing economic benefits of tourism and conservation function of the island is a challenging issue  
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20 analyzing the potential of mangrove forest in the island as sacred ecotourism destination. The tourist  
21 suitability index and carrying capacity of mangrove forest were carried to assess the potential  
22 development of the area. In addition, SWOT analysis was conducted to analysis development  
23 strategies of the ecotourism in the area. The results showed that Tourist Suitability Index (TSI) is  
24 74.36 percent, implying that the mangrove forest area in Nusa Penida Island is suitable to be  
25 developed as an eco-tourism site. The carrying capacity of the mangrove tour route is calculated at  
26 360 tourist per day. Based on SWOT analysis, the average of total IFAS and EFAS analysis score  
27 is 2.89 and 3.09 respectively, with internal external matrix is within the second quadrant of SWOT  
28 matrix. Several strategies recommendation are proposed. These include improving tourist  
29 infrastructure, stakeholder cooperation, improving tourist services, promoting nusa penida sacred  
30 ecotourism to public and tourists, supervising tourist activities, and carrying out conservation-based  
31 tourist activities.  
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34 Keywords: Mangrove Eco Tourism; Sacred Island; SWOT analysis; Tourist Suitability Index  
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37 **INTRODUCTION**  
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39 Mangrove forests, especially those in the tropical countries, play an important role both in  
40 terms of ecological function they provided and source of livelihood for coastal communities  
41 whereby millions of people depend on them. In terms of ecological function and blue economy  
42 paradigm, mangrove forests provide coastal protection, enhance coastal fisheries productivities,  
43 source of carbon sink, as well as nutrient cycle. As for their economic role, mangrove provide source  
44 of raw materials such as firewood, food and construction materials (Richards and Friess, 2016.,  
45 Cannici et al, 2008). In addition, mangrove ecosystem also provide social and cultural values in the  
46 form of recreational uses (Giri et al, 2011).  
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51 Despite their critical role both ecologically and economically, mangroves forests, especially in  
52 southeast Asia, have been experiencing extensive deforestation due to increase in demand for  
53 aquaculture and other land conversion for different purposes. Richards and Friess (2016) estimated  
54 that during period of 2000-2012, mangrove forests in Southeast Asia were lost at an average of  
55 0.18% per year with aquaculture accounting for 30% of this total forest change. In response to such  
56 a problem, government in many developing countries have developed various measures to protect  
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3 mangrove forests such as mangrove conservation, establishing marine protected areas, or  
4 designating mangrove forests as ecotourism areas. Such a measure has been implemented in Nusa  
5 Penida mangrove forest in Bali Indonesia.  
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8 Nusa Penida island in Bali Province has been designated as Marine Protected Area by local  
9 Klungkung regency in 2010 (Daulat et al 2018). The measure was supported by the Ministry of  
10 Fisheries and Marine affairs as an effort to protect mangrove forest in the area from anthropogenic  
11 pressures and other source of mangrove degradation. Mangrove forest in this island is mostly  
12 concentrated in Jungutbatu Village of Nusa Penida islands covering an area of 194 hectares. The  
13 mangrove forest is known for its pristine environment and attract tourists to visit the area. Based on  
14 survey conducted by Tania and Muljadi (2011), the number of foreign tourists visiting Nusa Penida  
15 reached 200,000 people per year. This provide an opportunity to develop and manage the mangrove  
16 area as eco-tourism area, so that the conservation and economic purposes of the mangrove  
17 management could be achieved.  
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23 **One of the challenging issues of managing mangrove ecotourism, however, is how to develop**  
24 **a comprehensive assessment strategy to develop mangrove as tourism destination. Up until now,**  
25 **such a management is lacking. The institutional arrangement of the ecotourism has net been**  
26 **developed yet. In addition, analysis of carrying capacity, which is essential for mangrove**  
27 **ecotourism, is not yet available.**  
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31 Considering these issues, this study attempts to fill the gaps, by developing sustainable  
32 strategies for mangrove ecotourism management in Nusa Penida sacred island. By doing so, this  
33 study begins with determining carrying capacity of the mangrove ecotourism, as well as the  
34 ecological suitability of the mangrove ecosystem for tourism. The results of the study could be used  
35 as policy guidelines for local government in managing ecotourism in sacred island of Nusa Penida  
36 Bali, as well as other similar ecotourism management elsewhere.  
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## 42 **LITERATURE REVIEW**

43 Mangrove forest is a tropical beach vegetation community, dominated by several types of  
44 mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen,  
45 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and  
46 sea. Therefore, mangrove eco system can be found in many shallow bay beaches, delta, and  
47 estuaries.  
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51 **Mangrove forests have enormous potential to be developed as eco-tourism sites. Definition of**  
52 **ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco tourism is used to**  
53 **describe trips to remote natural location for the purpose of enjoying and learning the nature and**  
54 **culture of local population. In 1996, Ceballos-Lascurain added the use environmentally friendly**  
55 **technology concepts in explaining ecotourism development.**  
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There are numerous activities which can be developed in mangrove ecotourism area such tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014; Hu et al., 2020; ). Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply considering economic benefits which can be obtained without exploiting the mangrove itself and achieve SDG (Kusmana and Istomo, 1993; Lee et al., 2020).

Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to enjoy the beauty of scenery and promote some elements of education in order to understand and support the environmental conservation efforts and the involvement of local communities in the eco-tourism destination areas for its management (Arida, 2016).

Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer line or the area which directly surrounded by sea water to mainland or association area. Findings of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996). Density is the number of trees per unit area.

Studies on managing degradation of mangrove ecosystem by designating the mangrove forest as ecotourism sites have been found in many literatures. Swangjang and Kornpiphat (2021), for example, using SWOT and DPSIR (Drive Pressure State Impact and Response) found that ecotourism could be used as a vehicle for sustainable mangrove forest in Thailand. They also found that carrying capacity and stakeholder engagement are key factors in sustainable ecotourism management. In addition, their analysis of sustainable tourism also found that to be sustainable, ecotourism should economically be viable, environmentally appropriate, and take into account sociocultural considerations.

Environmental carrying capacity refers to the capacity or ability of an ecosystem to support healthy organism life while maintain productivity, adaptability, and ability to renew itself. According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors which can be physically accommodated by the area provided at a certain time without causing disruption to both nature and humans.

The importance of carrying capacity as one of sustainability factors for ecotourism management can also be found in Liabastre and Rieder (2022). In their analysis of Ecotourism of Coron and El Nido in the Philippine, they found that a key managemeny tool for sustainable tourism is the concept of carrying capacity. Similar to findings by Swangjang and Kornpiphat (2021), stakeholder engagement is also one of important variables to determine the number of carring capacity for tourists in the ecotourism sites. They also emphasized that determining carrying capacity requires requires a combination of a science based assessment at specific sites, an understanding of the current impact on the biophysical environment.

The density of mangrove forest is one of indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove forest is used as a parameter in determining

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4 whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007). Eco-  
5 tourism activities planning should be tailored to the potential of natural resources and their  
6 allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1),  
7 appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five  
8 assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters  
9 are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and  
10 (5) biota.  
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14 Other factors that drive the ecotourism as sustainable solution to prevent mangrove degradation  
15 is the consideration of benefits derived from ecotourism. Fries (2017) noted that mangrove  
16 ecotourism has a number of potential benefits to local communities. These include direct financial  
17 benefits from ecotourism as well as livelihood diversification providing different employment  
18 opportunities. Mangrove ecotourism would also encourage the growth of local entrepreneurship and  
19 increase local skill and training due to demand from tourism activities. In addition to economic  
20 benefits, mangrove ecotourism would also promote local culture as well as empower marginalized  
21 section of the coastal communities.  
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25 In the development of an eco-tourism site, support and participation from the local community  
26 is obviously needed. This idea is in line with the concept of tourism development where eco-tourism  
27 development should rely on the development of local communities. A form of eco-tourism  
28 management needs to consider is community-based natural resource management. In its  
29 implementation, the community is involved starts from planning to supervision stage (Tahir and  
30 Baharudin, 2002).  
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34 Managing mangrove ecotourism sustainably requires a comprehensive strategic assessment.  
35 There numerous approaches to address this issue. One of the most popular ones is to use qualitative  
36 method such as SWOT analysis combined with other methods. For example, Murtini et al (2018)  
37 use SWOT analysis to develop ecotourism strategies in Wonorejo, Surabaya Indonesia. Their  
38 findings are in line with other studies that emphasize strong commitment both from the  
39 government as well as from the communities to support sustainable tourism. According Rangkuti  
40 (2006), a strategy is a comprehensive master planning which explains how to achieve the  
41 predetermined goals. Strategies are classified as activities to seek conformity between internal forces  
42 (strengths and weaknesses) and external forces (opportunities and threats). Although this method  
43 relatively simple, it can provide initial information regarding strategy that must be formulated in  
44 remote area.  
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## 53 **RESEARCH METHODS**

### 54 **Research Location and Timetable**

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The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research



object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist who lived while the research was carried out. The study has been conducted for 12 months, starting from November 2017 to October 2018. The

interview process was done at Nusa Penida Island. Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism (CIT)

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N \max} \right] x 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K x \frac{Lp}{Lt} x \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

Lt = Area unit for certain category (m<sup>2</sup> or m)

Wt = Time provided by the region for tourism activities in one day (hours)

Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K (Σ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

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7 **Analysis of Development Strategies for Mangrove Eco-tourism**

8 The technique used to create development strategy for mangrove eco-tourism was SWOT  
9 analysis. This analysis is a systematic identification of strategic factors to formulate a strategy  
10 (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths,  
11 weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal  
12 and external factors.  
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16 a. Analysis of internal factors (strengths and weaknesses);  
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18 b. Analysis of external factors (opportunities and threats);  
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20 c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are  
21 principally grouped into three main categories, namely: a). Growth Strategy or growth of the  
22 activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and  
23 8); b). Stability Strategy or a strategy which is implemented without changing the direction of  
24 the predetermined strategy (cells #4 and 5);  
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26 c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).  
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30 **FINDINGS AND DISCUSSION**

31 **General Condition of the Researched Area**

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34 Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397  
35 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for  
36 community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.  
37 50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the  
38 city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and  
39 Kangin II.  
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43 The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level  
44 (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from  
45 December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu  
46 village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is  
47 less than 30 cm.  
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50 The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males  
51 and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a  
52 population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private  
53 employees (1,425 people). The education level of the population in Jungutbatu village respectively  
54 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high  
55 school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or  
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3 diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-  
4 2020).  
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### 8 **Conformity of Mangrove Eco-tourism (CIT)**

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10 Before developing mangrove area as a tourism site, potential resources and their allocation  
11 should be measured and identified in advance. The Conformity Index for Tourism (CIT) is  
12 identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is  
13 Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment  
14 parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove,  
15 mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the  
16 results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table  
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23 Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village  
24

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

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Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9 with CIT value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate or S2 (50 - <80%). **The effort for developing mangrove area to be sustainable tourism should optimize**

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3 natural resources use and respect the sociocultural characteristics of local communities. This  
4 result was supported by former research result that stated some mangrove area suitable to be  
5 ecotourism destination (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021);  
6 (Opa et al., 2021).  
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## 10 11 **Area Carrying Capacity (CC)**

12 The results of measurement and observation in the field found that the length of sailing path was  
13 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was  
14 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.  
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16 Based on the area carrying capacity (CC), the maximum people joining the sailing path which  
17 can be accommodated are 360 people per day approximately for 8 hours. Recently, the number of  
18 tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be  
19 improved. This number of person below the capacity of Lembar mangrove ecotourism in Lombok  
20 Island which reached 2337 people per day (Sukuryadi, Harahab, Primyastanto, & Semedi, 2020).  
21 On the other side, the limited capacity of Nusa Penida due to the topography and its sacredness.  
22 Unfortunately, in pick season, as of July to September, the number of visits increased sharply until  
23 400 tourists per day. This condition should get serious attention by the mangrove tour managers. If  
24 the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting  
25 each other or turned into another activities such as snorkeling or diving. These efforts should be  
26 done to avoid negative impacts on mangrove ecosystem in this island.  
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## 36 **The Results of Internal Factor Strategic Analysis Summary (IFAS) and** 37 **External Factor Strategic Analysis Summary (EFAS)**

38 The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed  
39 as an eco-tourism site, yet there are also various weaknesses or problems and threats in the  
40 implementation which need serious attention from the manager. The suitable strategy should  
41 develop based on existing condition involving elements of strengths, weaknesses, opportunities and  
42 threats. In addition, the right strategy can avoid damage to natural and institutional resources.  
43

44 The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of  
45 mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained  
46 by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33.  
47 It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and  
48 existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.  
49 It was also identified that the highest weakness factor is the inadequate supporting facilities and  
50 infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing  
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weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community. The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. Internal External Matrix

**TOTAL SCORE OF INTERNAL FACTORS**

	STRONG 4,0	AVERAGE 3,0	WEAK 2,0
HIGH 3,0	I Growth Concentration through Vertical Integration	<b>II Growth Concentration through Horizontal Integration</b>	III Retrenchment Turn Around
AVERAGE 2,0	IV Stability Carefulness	V Growth Concentration though Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment
WEAK 1,0	VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

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- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
  - b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
  - c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
  - d. **Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated that sustainable mangrove ecotourism should be based on local wisdom and designated by appropriate regulation and policies (Syafri Harto, 2021) and suitable with blue economy principle (Lee et al., 2020).**
  - e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

Developing mangrove forest as an ecotourism area could not only help to reduce degradation of forest ecosystem, but also could improve social and economic condition for the communities through the improvement in income and improvement of general well-being from ecosystem services derived from mangrove forest. This study shows that development of ecotourism in Nusa Penida is feasible shown by the suitability index and carrying capacity of the forest area to accommodate more than 350 people per day.

To achieve sustainable ecotourism strategies of Nusa Penida island, stakeholder engagement is factor that need to be strengthen along with continuing promotion of the ecotourism and inviting investors. In addition, the type of tourist services both in terms of variation of services and quality of services, as well as public infrastructure that support ecotourism in the area need to be improved. The results of this study also indicate that creating better design plan and regulation of mangrove eco-tourism management and improvement in monitoring the tourist activities and implementing

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3 conservation-based tourist activities are factors that need to be considered for sustainable ecotourism  
4 in the area.  
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## 7 8 **Recommendations** 9

10 Mangrove ecotourism is derived its benefit from the continuing services from nature.  
11 Therefore, it is recommended that assessment of potential fauna that attract more tourists in the area  
12 is needed. It is also important to consider that human resources are paramount factors for sustainable  
13 ecotourism. Therefore, investment in human resources to support ecotourism and to improve social-  
14 economic condition in other tourism related sectors is highly recommended.  
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[Click here to view linked References](#)

## **Authors' response to reviewers' comments**

Dear all reviewers,

Thank you for giving us the opportunity to submit a revised draft of our manuscript titled “DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA” to the International Journal of Environment, Development and Sustainability. We really appreciate the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers’ comments and concerns.

### **Response to Reviewer #1**

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section.

#### **Reviewer #1:**

The author does not explain and elaborate more deeply on each finding (tables/figures) by confirming similar studies/library review. Thus, the author does not get a complete picture of the purpose of his research.

Authors need to adopt more reading material, add references, elaborate, in order to produce enrichment of theoretical concepts and implementation of their research

The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal

#### **Response #1:**

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the ‘response’ section. We describe one by one to response every comment, become as follows:

*“The effort for developing mangrove area to be sustainable tourism should optimize natural resources use and respect the sociocultural characteristics of local communities. This result was supported by former research result that stated some mangrove area suitable to be ecotourism destinationa (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021) (page 9).*

*Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. Recently, the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. This number of person below the capacity of Lembar mangrove ecotourism in Lombok Island which reached 2337 people per day (Sukuryadi, Harahab, Primyastanto, & Semedi, 2020). On the other side, the limited capacity of Nusa Penida due to the topography and it sacredness. Unfortunately, in pick season, as of July to September, the number of visits increased sharply until 400 tourists per day. This condition should get serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another*



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activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in this island (page 9).

*Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated that sustainable mangrove ecotourism should be based on local wisdom and designated by appropriate regulation and policies (Syafri Harto, 2021) and suitable with blue economy principle (Lee et al., 2020) (page 11)".*

**Comment #2:**

The author should develop a complete thought or idea to build a paragraph. Write more sentences and broaden the point of view to enrich the ideas in a paragraph. See published works in this journal

**Response #2:**

We agree with this and have incorporated your suggestion throughout the manuscript. We have, accordingly, revised and put some detailed explanations Please find some improvement in our manuscript onpage 9-11.

*"The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which need serious attention from the manager. The suitable strategy should develop based on existing condition involving elements of strengths, weaknesses, opportunities and threats. In addition, the right strategy can avoid damage to natural and institutional resources".*

[Click here to view linked References](#)

## **Authors' response to reviewers' comments**

Dear all reviewers,

Thank you for giving us the opportunity to submit a revised draft of our manuscript titled "DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA" to the International Journal of Environment, Development and Sustainability. We really appreciate the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

### **Response to Reviewer #4**

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section.

#### **Reviewer #4:**

You should do all comments one by one. I can't find your response (all answers must be highlighted on body manuscript). If you couldn't do any comments, We will reject your article. back to ENVI-D-19-00627R2.

#### **Response #1:**

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'response' section. We describe one by one to response every comment from reviewer such as comment from reviewer and have highlighted, become as follows:

*"The effort for developing mangrove area to be sustainable tourism should optimize natural resources use and respect the sociocultural characteristics of local communities. This result was supported by former research result that stated some mangrove area suitable to be ecotourism destinationa (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021) (page 9).*

*Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. Recently, the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. This number of person below the capacity of Lembar mangrove ecotourism in Lombok Island which reached 2337 people per day (Sukuryadi, Harahab, Primyastanto, & Semedi, 2020). On the other side, the limited capacity of Nusa Penida due to the topography and it sacredness. Unfortunately, in pick season, as of July to September, the number of visits increased sharply until 400 tourists per day. This condition should get serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in this island (page 9).*

1 *Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of*  
2 *mangrove eco-tourism management and making regulations about mangrove eco-tourism*  
3 *management as well as stated that sustainable mangrove ecotourism should be based on local wisdom*  
4 *and designated by appropriate regulation and policies (Syafri Harto, 2021) and suitable with blue*  
5 *economy principle (Lee et al., 2020) (page 11)".*  
6

7 **Comment #2:**

8 The author should develop a complete thought or idea to build a paragraph. Write more  
9 sentences and broaden the point of view to enrich the ideas in a paragraph. See published  
10 works in this journal  
11

12 **Response #2:**

13 We agree with this and have incorporated your suggestion throughout the manuscript. We have,  
14 accordingly, revised and put some detailed explanations Please find some improvement in our  
15 manuscript onpage 9-11.  
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19 *"The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed*  
20 *as an eco-tourism site, yet there are also various weaknesses or problems and threats in the*  
21 *implementation which need serious attention from the manager. The suitable strategy should develop*  
22 *based on existing condition involving elements of strengths, weaknesses, opportunities and threats. In*  
23 *addition, the right strategy can avoid damage to natural and institutional resources".*  
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## **Authors' response to reviewers' comments**

Dear Editor in Chief and all reviewers,

Thank you for giving us opportunity to submit a revised draft of our manuscript and also for a good news that this article will be accepted after minor revision. We deliver big appreciation for the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

### Response to Reviewer #5

#### Comment #1:

The author needs to include some empirical evidence (facts and figures) in introduction section to support and justify the issue of this study.

#### Response #1:

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'introduction' section. We put some additional empirical evidence by modifying sentences that are on second paragraph, become as follows:

"Nusa Penida island in Bali Province has been designated as Marine Protected Area by local Klungkung regency in 2010 (Daulat et al 2018). The measure was supported by the Ministry of Fisheries and Marine affairs as an effort to protect mangrove forest in the area from anthropogenic pressures and other source of mangrove degradation. Mangrove forest in this island is mostly concentrated in Jungutbatu Village of Nusa Penida islands covering an area of 194 hectares. The mangrove forest is known for its pristine environment and attract tourists to visit the area. Based on survey conducted by Tania and Muljadi (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year. This provide an opportunity to develop and manage the mangrove area as eco-tourism area, so that the conservation and economic purposes of the mangrove management could be achieved."

#### Comment #2:

Motivation towards the topic/issue is not enough. The study needs to embrace more theoretical evidences in introduction section to elaborate the statement of the problem.

#### Response #2:

Thank you for suggesting us to strengthening the motivation toward the topic. We have added sentences on third paragraph line 10-12 to elaborate the statement of the problem as follows "Unfortunately, mangrove ecosystems in Nusa Penida have not been managed as tourist destinations, so that it is necessary to study the condition of various aspect related to suitability, carrying capacity and priority strategy."

#### Comment #3:

Mention the source of the methodology used in table 1.

#### Response #3:

Thank you for your comments. Therefore, as suggested by the reviewer, we have revised and put source of methodology used in table1.

#### Comment #4:

The methodologies and their constructed values in table 1 and 2 need more explanations/interpretations.

#### Response #4:

Thank you for your suggestion. As suggested by the reviewer, we have explained and given more interpretations in result and discussion, such as:

source or methodology used in table1.

Comment #4:

The methodologies and their constructed values in table 1 and 2 need more explanations/interpretations.

Response #4:

Thank you for your suggestion. As suggested by the reviewer, we have explained and given more interpretations in result and discussion, such as:

“The carrying capacity arrangement was intended to maintain the authenticity and sacredness of Nusa Penida. Exceeding the carrying capacity tend to cause congestion which reduces the comfort of tourist. The most important in mangrove tourism development is facilities, activities and wildlife. Therefore, the comfort factor should be maintain.”

# Environment, Development and Sustainability

## DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA

--Manuscript Draft--

<b>Manuscript Number:</b>	ENVI-D-19-00627R5
<b>Full Title:</b>	DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA
<b>Article Type:</b>	Original paper
<b>Keywords:</b>	Mangrove Eco Tourism; Sacred Island; SWOT analysis; Tourist Suitability Index
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<b>Order of Authors Secondary Information:</b>	
<b>Funding Information:</b>	
<b>Abstract:</b>	<p>One of the famous tourism sites in Bali Province Indonesia is Nusa Penida island. Located in the eastern part of the Bali, the small island is very famous tourist destination attracting more than two hundred thousand people per year. Nusa Penida, however, is not only designated as tourist destination but also designated as conservation buffer zone for the island of Bali. Therefore, balancing economic benefits of tourism and conservation function of the island is a challenging issue in the tourism management of the small island. This study attempts to address such an issue by analyzing the potential of mangrove forest in the island as sacred ecotourism destination. The tourist suitability index and carrying capacity of mangrove forest were carried to assess the potential development of the area. In addition, SWOT analysis was conducted to analysis development strategies of the ecotourism in the area. The results showed that Tourist Suitability Index (TSI) is 74.36 percent, implying that the mangrove forest area in Nusa Penida Island is suitable to be developed as an eco-tourism site. The carrying capacity of the r mangrove tour route is calculated at 360 tourist per day. Based on SWOT analysis, the average of total IFAS and EFAS analysis score is 2.89 and 3.09 respectively, with internal external matrix is within the second quadrant of SWOT matrix. Several strategies recommendation are proposed. These include improving tourist infrastructure, stakeholder cooperation, improving tourist services, promoting nusa penida sacred ecotourism to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities.</p>
<b>Response to Reviewers:</b>	<p>Authors' response to reviewers' comments Dear Editor in Chief and all reviewers, Thank you for giving us opportunity to submit a revised draft of our manuscript and also for a good news that this article will be accepted after minor revision. We deliver big appreciation for the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided</p>

by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

Response to Reviewer #4:

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section

Comment#1:

Chapter numbering does not follow the journal style. Check if you have included enough details on statistics (number of replicates, statistical tests performed, presentation of average and standard deviation or error values, both in tables and graphs), and complete it if needed.

Response #1:

Thank you for reminding this important thing. We agree with this comment and we have adapted the guidance for author and hope nothing is missed. There is no numbering in chapter.

Comment #2:

What are the original, novelty, or unique ideas behind this research as compared to previous research/other reported work? Why it is worth knowing?

Response #2:

The originality of this research lies in complexity of problem solving that using quantitative and qualitative method to determine the suitability of mangrove forest area to be tourism destination, carrying capacity and appropriate strategy.

The novelty of this study lies in the implementation of mixed method by combining conformity index for tourism, carrying capacity and SWOT. This is the first research on related issues in Nusa Penida.

The uniqueness is the development of tourism on sacred island and how to develop a comprehensive assessment strategy to develop mangrove as tourism destination.

Comment #3:

The logic of the current introduction should be revised, objectives of this study need to be changed.

Response #3:

We agree with this and have incorporated your suggestion throughout the manuscript. Please find some improvement in our manuscript on paragraph 4th, line 4-8 and paragraph 5th.

"In addition, analysis of carrying capacity, which is essential for mangrove ecotourism, is not sufficiently available. The last study related to carrying capacity of this area was carried out using data from 2012-2013 (Bato et al., 2013). In 2020, only research on environmental management models is available in this island without carrying capacity analysis and also not formulating a mangrove forest management strategy as a tourism destination (Sudipa, et al, 2020)."

"Considering these issues, this study attempts to fill the gaps, by developing sustainable strategies for mangrove ecotourism management in Nusa Penida sacred island. By doing so, this study begins with determining carrying capacity of the mangrove ecotourism, as well as the ecological suitability of the mangrove ecosystem for tourism. The results of the study could be used as policy guidelines for local government in managing ecotourism in sacred island of Nusa Penida Bali, as well as other similar ecotourism management elsewhere."

Comment #4:

where is title fig1?

Response #4:

I do apologize for missing the title and thank you for your comment. Therefore, as suggested by the reviewer, we

Response to Reviewer #5

Comment #1:

The author needs to include some empirical evidence (facts and figures) in introduction section to support and justify the issue of this study.

Response #1:

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'introduction' section. We put some additional empirical evidence by modifying sentences that are on second paragraph, become as follows:  
"Nusa Penida island in Bali Province has been designated as Marine Protected Area by local Klungkung regency in 2010 (Daulat et al 2018). The measure was supported by the Ministry of Fisheries and Marine affairs as an effort to protect mangrove forest in the area from anthropogenic pressures and other source of mangrove degradation. Mangrove forest in this island is mostly concentrated in Jungutbatu Village of Nusa Penida islands covering an area of 194 hectares. The mangrove forest is known for its pristine environment and attract tourists to visit the area. Based on survey conducted by Tania and Muljadi (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year. This provide an opportunity to develop and manage the mangrove area as eco-tourism area, so that the conservation and economic purposes of the mangrove management could be achieved."

Comment #2:

Motivation towards the topic/issue is not enough. The study needs to embrace more theoretical evidences in introduction section to elaborate the statement of the problem.

Response #2:

Thank you for suggesting us to strengthening the motivation toward the topic. We have added sentences on third paragraph line 10-12 to elaborate the statement of the problem as follows

"Unfortunately, mangrove ecosystems in Nusa Penida have not been managed as tourist destinations, so that it is necessary to study the condition of various aspect related to suitability, carrying capacity and priority strategy."

Comment #3:

Mention the source of the methodology used in table 1.

Response #3:

Thank you for your comments. Therefore, as suggested by the reviewer, we have revised and put source of methodology used in table1.

Comment #4:

The methodologies and their constructed values in table 1 and 2 need more explanations/interpretations.

Response #4:

Thank you for your suggestion. As suggested by the reviewer, we have explained and given more interpretations in result and discussion, such as:

"The carrying capacity arrangement was intended to maintain the authenticity and sacredness of Nusa Penida. Exceeding the carrying capacity tend to cause congestion which reduces the comfort of tourist. The most important in mangrove tourism development is facilities, activities and wildlife. Therefore, the comfort factor should be maintain."

Response to Reviewer #6:

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section

Comment#1:

This study investigates the tourist suitability index and carrying capacity to assess the potential of the mangrove forest on Nusa Penida Island. With a few revision, this study deserves publication.

"Based on survey conducted by Tania and Muljadi (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year."

Is there any more recent data? If this is the most recent data, it should be highlighted in the text.

Response #1:

Thank your for pointing this out. We put recent data becomes as follow:



"...the number of foreign tourists visiting Nusa Penida reached 200,000 people per year but decrease in 2018 to 133, 848 people per year (Sudipa, et al, 2020)."

Comment #2:

Errors in references should be fixed

"This result was supported by former research result that stated some mangrove area suitable to be ecotourism destination (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021)."

To be

The effort for developing mangrove area to be sustainable tourism should optimize natural resources use and respect the sociocultural characteristics of local communities. This result was supported by research result that stated some mangrove area suitable to be ecotourism destination (Chasanah, et al, 2017; Hermon, et al, 2018; Swangjang and Kornpiphat, 2021; Opa et al., 2021)

Also in the other reference.

Response #2:

Thank you for pointing this out. I agree with comment. Therefore, we have fixed it.

Comment #3:

In the conclusion section, the innovative aspect and limitations of this study should be mentioned.

Response #3:

We agree with this and have incorporated your suggestion throughout the manuscript.

Please find some improvement in our manuscript on conclusion.

"This study also demonstrates a novel research approach that combine quantitative and qualitative method in assessing mangrove forest development. However, the qualitative method used needs to be developed in order to determine the priority strategy."

**DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND,  
BALI, INDONESIA**

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## DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA

### ABSTRACT

One of the famous tourism sites in Bali Province Indonesia is Nusa Penida island. Located in the eastern part of the Bali, the small island is very famous tourist destination attracting more than two hundred thousand people per year. Nusa Penida, however, is not only designated as tourist destination but also designated as conservation buffer zone for the island of Bali. Therefore, balancing economic benefits of tourism and conservation function of the island is a challenging issue in the tourism management of the small island. This study attempts to address such an issue by analyzing the potential of mangrove forest in the island as sacred ecotourism destination. The tourist suitability index and carrying capacity of mangrove forest were carried to assess the potential development of the area and developing sustainable strategies for mangrove ecotourism management in Nusa Penida sacred island. By doing so, this study begins with determining carrying capacity of the mangrove ecotourism, as well as the ecological suitability of the mangrove ecosystem for tourism. In addition, SWOT analysis was conducted to analysis development strategies of the ecotourism in the area. The results showed that conformity index for tourism (CTI) is 74.36 percent, implying that the mangrove forest area in Nusa Penida Island is appropriate to be developed as an eco-tourism site. The carrying capacity of the mangrove tour route is calculated at 360 tourist per day. Based on SWOT analysis, the average of total IFAS and EFAS analysis score is 2.89 and 3.09 respectively, with internal external matrix is within the second quadrant of SWOT matrix. Several strategies recommendation are proposed. These include improving tourist infrastructure, stakeholder cooperation, improving tourist services, promoting nusa penida sacred ecotourism to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities.

Keywords: Conformity Index for Tourism; Mangrove Eco Tourism; Sacred Island; SWOT analysis

### INTRODUCTION

Mangrove forests, especially those in the tropical countries, play an important role both in terms of ecological function they provided and source of livelihood for coastal communities whereby millions of people depend on them. In terms of ecological function and blue economy paradigm, mangrove forests provide coastal protection, enhance coastal fisheries productivities, source of carbon sink, as well as nutrient cycle. As for their economic role, mangrove provide source of raw materials such as firewood, food and construction materials (Richards and Friess, 2016., Cannici et al, 2008). In addition, mangrove ecosystem also provide social and cultural values in the form of recreational uses (Giri et al, 2011).

Despite their critical role both ecologically and economically, mangroves forests, especially in southeast Asia, have been experiencing extensive deforestation due to increase in demand for aquaculture and other land conversion for different purposes. Richards and Friess (2016) estimated that during period of 2000-2012, mangrove forests in Southeast Asia were lost at an average of 0.18% per year with aquaculture accounting for 30% of this total forest change. In response to such

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4 a problem, government in many developing countries have developed various measures to protect  
5 mangrove forests such as mangrove conservation, establishing marine protected areas, or  
6 designating mangrove forests as ecotourism areas. Such a measure has been implemented in Nusa  
7 Penida mangrove forest in Bali Indonesia.

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10 Nusa Penida island in Bali Province has been designated as Marine Protected Area by local  
11 Klungkung regency in 2010 (Daulat et al 2018). The measure was supported by the Ministry of  
12 Fisheries and Marine affairs as an effort to protect mangrove forest in the area from anthropogenic  
13 pressures and other source of mangrove degradation. Mangrove forest in this island is mostly  
14 concentrated in Jungutbatu Village of Nusa Penida islands covering an area of 194 hectares. The  
15 mangrove forest is known for its pristine environment and attract tourists to visit the area. Based on  
16 survey conducted by Tania and Muljadi (2011), the number of foreign tourists visiting Nusa Penida  
17 reached 200,000 people per year but decrease in 2018 to 133, 848 people per year (Sudipa, et al,  
18 2020). This provide an opportunity to develop and manage the mangrove area as eco-tourism area,  
19 so that the conservation and economic purposes of the mangrove management could be achieved.  
20 Unfortunately, mangrove ecosystems in Nusa Penida have not been managed as tourist destinations,  
21 so that it is necessary to study the condition of various aspect related to suitability, carrying capacity  
22 and priority strategy.

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25 One of the challenging issues of managing mangrove ecotourism, however, is how to develop  
26 a comprehensive assessment strategy to develop mangrove as tourism destination. Up until now,  
27 such a management is lacking. The institutional arrangement of the ecotourism has not been  
28 developed yet. In addition, analysis of carrying capacity, which is essential for mangrove  
29 ecotourism, is not sufficiently available. The last study related to carrying capacity of this area was  
30 carried out using data from 2012-2013 (Bato et al., 2013). In 2020, there is only research on  
31 environmental management models is available in this island without carrying capacity analysis and  
32 also not formulating a mangrove forest management strategy as a tourism destination (Sudipa, et al,  
33 2020).

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36 Considering these issues, this study attempts to fill the gaps, by developing sustainable  
37 strategies for mangrove ecotourism management in Nusa Penida sacred island. By doing so, this  
38 study begins with determining carrying capacity of the mangrove ecotourism, as well as the  
39 ecological suitability of the mangrove ecosystem for tourism. The results of the study could be used  
40 as policy guidelines for local government in managing ecotourism in sacred island of Nusa Penida  
41 Bali, as well as other similar ecotourism management elsewhere.

## 42 43 44 45 46 47 48 49 50 51 52 53 54 **LITERATURE REVIEW**

55  
56 Mangrove forest is a tropical beach vegetation community, dominated by several types of  
57 mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen,  
58 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and  
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4 sea. Therefore, mangrove eco system can be found in many shallow bay beaches, delta, and  
5 estuaries.

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7 Mangrove forests have enormous potential to be developed as eco-tourism sites. Definition of  
8 ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco tourism is used to  
9 describe trips to remote natural location for the purpose of enjoying and learning the nature and  
10 culture of local population. In 1996, Ceballos-Lascurain added the use environmentally friendly  
11 technology concepts in explaining ecotourism development.

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14 There are numerous activities which can be developed in mangrove ecotourism area such  
15 tracking, marine activities, bird watching, education, and research (Putra, 2014; Hu et al., 2020).  
16 Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply  
17 considering economic benefits which can be obtained without exploiting the mangrove itself and  
18 achieve SDG (Kusmana and Istomo, 1993; Lee et al., 2020).

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21 Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to enjoy  
22 the beauty of scenery and promote some elements of education in order to understand and support  
23 the environmental conservation efforts and the involvement of local communities in the eco-tourism  
24 destination areas for its management (Arida, 2016).

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27 Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer  
28 line or the area which directly surrounded by sea water to mainland or association area. Findings of  
29 a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees  
30 per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).  
31 Density is the number of trees per unit area.

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35 Studies on managing degradation of mangrove ecosystem by designating the mangrove forest  
36 as ecotourism sites have been found in many literatures. Swangjang and Kornpiphat (2021), for  
37 example, using SWOT and DPSIR (Drive Pressure State Impact and Response) found that  
38 ecotourism could be used as a vehicle for sustainable mangrove forest in Thailand. They also found  
39 that carrying capacity and stakeholder engagement are key factors in sustainable ecotourism  
40 management. In addition, their analysis of sustainable tourism also found that to be sustainable,  
41 ecotourism should economically be viable, environmentally appropriate, and take into account  
42 sociocultural considerations.

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48 Environmental carrying capacity refers to the capacity or ability of an ecosystem to support  
49 healthy organism life while maintain productivity, adaptability, and ability to renew itself.  
50 According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors  
51 which can be physically accommodated by the area provided at a certain time without causing  
52 disruption to both nature and humans.

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58 The importance of carrying capacity as one of sustainability factors for ecotourism  
59 management can also be found in Liabastre and Rieder (2022). In their analysis of Ecotourism of  
60 Coron and El Nido in the Philippine, they found that a key managemeny tool for sustainable tourism

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3 is the concept of carrying capacity. Similar to findings by Swangiang and Kornpiphat (2021),  
4 stakeholder engagement is also one of important variables to determine the number of carrying  
5 capacity for tourists in the ecotourism sites. They also emphasized that determining carrying  
6 capacity requires requires a combination of a science based assessment at specific sites, an  
7 understanding of the current impact on the biophysical environment.  
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11 The density of mangrove forest is one of indicators in assessing the quality of mangrove forest  
12 ecosystem itself. In addition, the density of mangrove forest is used as a parameter in determining  
13 whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007). Eco-  
14 tourism activities planning should be tailored to the potential of natural resources and their  
15 allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1),  
16 appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five  
17 assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters  
18 are (1) thickness level of mangrove; (2) types of mangrove; (3) mangrove density; (4) sea wave and  
19 (5) biota.  
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23 Other factors that drive the ecotourism as sustainable solution to prevent mangrove degradation  
24 is the consideration of benefits derived from ecotourism. Fries (2017) noted that mangrove  
25 ecotourism has a number of potential benefits to local communities. These include direct financial  
26 benefits from ecotourism as well as livelihood diversification providing different employment  
27 opportunities. Mangrove ecotourism would also encourage the growth of local entrepreneurship and  
28 increase local skill and training due to demand from tourism activities. In addition to economic  
29 benefits, mangrove ecotourism would also promote local culture as well as empower marginalized  
30 section of the coastal communities.  
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34 In the development of an eco-tourism site, support and participation from the local community  
35 is obviously needed. This idea is in line with the concept of tourism development where eco-tourism  
36 development should rely on the development of local communities. A form of eco-tourism  
37 management needs to consider is community-based natural resource management. In its  
38 implementation, the community is involved starts from planning to supervision stage (Tahir and  
39 Baharudin, 2002).  
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43 Managing mangrove ecotourism sustainably requires a comprehensive strategic assessment.  
44 There numerous approaches to address this issue. One of the most popular ones is to use qualitative  
45 method such as SWOT analysis combined with other methods. For example, Murtini et al (2018)  
46 use SWOT analysis to develop ecotourism strategies in Wonorejo, Surabaya Indonesia. Their  
47 findings are in line with other studies that emphasize strong commitment both from the  
48 government as well as from the communities to support sustainable tourism. According Rangkuti  
49 (2006), a strategy is a comprehensive master planning which explains how to achieve the  
50 predetermined goals. Strategies are classified as activities to seek conformity between internal forces  
51 (strengths and weaknesses) and external forces (opportunities and threats). Although this method  
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relatively simple, it can provide initial information regarding strategy that must be formulated in remote area.

## RESEARCH METHODS

### Research Location and Timetable

The research was conducted in Nusa Penida island, Klungkung regency, Bali (Figure 1). The research object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist who lived while the research was carried out. The study has been conducted for 12 months, starting from November 2017 to October 2018. The interview process was done at Nusa Penida Island. Deep interview used questioner for guiding the discussion.



Figure 1. Nusa Penida Island, Bali, Indonesia

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism (CIT)

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
			S1		S2		S3		N	
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0

3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

Source: Manan & Haryanto, 2018; Yulianda, 2007

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N \max} \right] x 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K x \frac{Lp}{Lt} x \frac{Wt}{Wp}$$

where :

CC = Area Carrying Capacity (people per day)

K = The ecological potential of visitors per area unit (people)

Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)

Lt = Area unit for certain category (m<sup>2</sup> or m)

Wt = Time provided by the region for tourism activities in one day (hours)



Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K ( $\Sigma$ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

### Analysis of Development Strategies for Mangrove Eco-tourism

The technique used to create development strategy for mangrove eco-tourism was SWOT analysis. This analysis is a systematic identification of strategic factors to formulate a strategy (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths, weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal and external factors.

- Analysis of internal factors (strengths and weaknesses);
- Analysis of external factors (opportunities and threats);
- Internal External Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are principally grouped into three main categories, namely: a). Growth Strategy or growth of the activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and 8); b). Stability Strategy or a strategy which is implemented without changing the direction of the predetermined strategy (cells #4 and 5);
- Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).

## FINDINGS AND DISCUSSION

### General Condition of the Researched Area

Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is located 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely “Kaja I”, “Kaja II”, “Kelod I”, “Kelod II”, “Kangin I”, and “Kangin II”.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from

December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2018 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### Conformity of Mangrove Eco-tourism (CIT)

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism (CIT) is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). The conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island

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4 has a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9  
5 with CIT value of 23.08%, indicating that the mangroves have a rich diversity (Yulianda,  
6 2007). Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%.  
7  
8 The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category  
9 of "Conditional". Its biota has the category of "Highly Suitable" with value of 7.60% where  
10 biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating  
11 that the mangrove forest area in Nusa Penida Island is in the category of appropriate or S2 (50  
12 - <80%). The effort for developing mangrove area to be sustainable tourism should optimize  
13 natural resources use and respect the sociocultural characteristics of local communities. This  
14 result was supported by research result that stated some mangrove area suitable to be  
15 ecotourism destination (Chasanah, et al, 2017; Hermon, et al, 2018; Swangjang and  
16 Kornpiphat, 2021; Opa et al., 2021)

### 22 23 **Area Carrying Capacity (CC)**

24  
25 The results of measurement and observation in the field found that the length of sailing path was  
26 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was  
27 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

28  
29 Based on the area carrying capacity (CC), the maximum people joining the sailing path which  
30 can be accommodated are 360 people per day approximately for 8 hours higher than previous study  
31 which only reach 122 people per day (Bato et al., 2013). Recently, the number of tourist visits, an  
32 average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. This  
33 number of person below the capacity of Lembar mangrove ecotourism in Lombok Island which  
34 reached 2337 people per day (Sukuryadi, Harahab, Primyastanto, & Semedi, 2020). On the other  
35 side, the limited capacity of Nusa Penida due to the topography and its sacredness. Unfortunately,  
36 in pick season, as of July to September, the number of visits increased sharply until 400 tourists per  
37 day. This condition should get serious attention by the mangrove tour managers. If the number of  
38 visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or  
39 turned into another activities such as snorkeling or diving. These efforts should be done to avoid  
40 negative impacts on mangrove ecosystem in this island. Figure 2 show natural tourism destination  
41 in Nusa Penida.

42  
43 The carrying capacity arrangement was intended to maintain the authenticity and sacredness of  
44 Nusa Penida. Exceeding the carrying capacity tend to cause congestion which reduces the comfort  
45 of tourist. The most important in mangrove tourism development is facilities, activities and wildlife.  
46 Therefore, the comfort factor should be maintain.

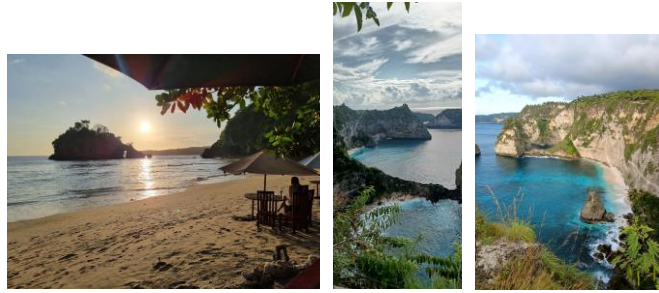


Figure 2. The Sacred Natural Island Nusa Penida, Bali, Indonesia

### **The Results of Internal Factor Strategic Analysis Summary (IFAS) and External Factor Strategic Analysis Summary (EFAS)**

The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which need serious attention from the manager. The suitable strategy should develop based on existing condition involving elements of strengths, weaknesses, opportunities and threats. In addition, the right strategy can avoid damage to natural and institutional resources.

The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism. It was also identified that the highest weakness factor is the inadequate supporting facilities and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community. The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

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Table 4. Internal External Matrix

**TOTAL SCORE OF INTERNAL FACTORS**

		STRONG 4,0	AVERAGE 3,0	WEAK 2,0	1,0
HIGH 3,0	I Growth Concentration through Vertical Integration	<b>II Growth Concentration through Horizontal Integration</b>	III Retrenchment Turn Around		
	IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment		
AVERAGE 2,0					
WEAK 1,0	VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation		

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area. **This strategy support previous study related to environmental management model in Nusa Penida that conducted by (Sudipa et al., 2020)**
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.

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- d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated that sustainable mangrove ecotourism should be based on local wisdom and designated by appropriate regulation and policies (Syafri Harto, 2021) and suitable with blue economy principle (Lee et al., 2020).
  - e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## 19 CONCLUSIONS AND RECOMMENDATIONS

### 20 Conclusions

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Developing mangrove forest as an ecotourism area could not only help to reduce degradation of forest ecosystem, but also could improve social and economic condition for the communities through the improvement in income and improvement of general well-being from ecosystem services derived from mangrove forest. This study shows that development of ecotourism in Nusa Penida is feasible shown by the suitability index and carrying capacity of the forest area to accommodate more than 360 people per day.

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To achieve sustainable ecotourism strategies of Nusa Penida island, stakeholder engagement is factor that need to be strengthen along with continuing promotion of the ecotourism and inviting investors. In addition, the type of tourist services both in terms of variation of services and quality of services, as well as public infrastructure that support ecotourism in the area need to be improved. The results of this study also indicate that creating better design plan and regulation of mangrove eco-tourism management and improvement in monitoring the tourist activities and implementing conservation-based tourist activities are factors that need to be considered for sustainable ecotourism in the area.

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This study also demonstrates a novel research approach that combine quantitative and qualitative method in assessing mangrove forest development. However, the qualitative method used needs to be developed in order to determine the priority strategy.

### 49 Recommendations

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Mangrove ecotourism is derived its benefit from the continuing services from nature. Therefore, it is recommended that assessment of potential fauna that attract more tourists in the area is needed. It is also important to consider that human resources are paramount factors for sustainable ecotourism. Therefore, investment in human resources to support ecotourism and to improve social-economic condition in other tourism related sectors is highly recommended.

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**Authors' response to reviewers' comments**

Dear Editor in Chief and all reviewers,

Thank you for giving us opportunity to submit a revised draft of our manuscript and also for a good news that this article will be accepted after minor revision. We deliver big appreciation for the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our paper. We fully considered and dealt with all of them. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewers. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

**Response to Reviewer #4:**

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section

**Comment#1:**

Chapter numbering does not follow the journal style. Check if you have included enough details on statistics (number of replicates, statistical tests performed, presentation of average and standard deviation or error values, both in tables and graphs), and complete it if needed.

**Response #1:**

Thank you for reminding this important thing. We agree with this comment and we have adapted the guidance for author and hope nothing is missed. There is no numbering in chapter.

**Comment #2:**

What are the original, novelty, or unique ideas behind this research as compared to previous research/other reported work? Why it is worth knowing?

**Response #2:**

The originality of this research lies in complexity of problem solving that using quantitative and qualitative method to determine the suitability of mangrove forest area to be tourism destination, carrying capacity and appropriate strategy.

The novelty of this study lies in the implementation of mixed method by combining conformity index for tourism, carrying capacity and SWOT. This is the first research on related issues in Nusa Penida.

The uniqueness is the development of tourism on sacred island and how to develop a comprehensive assessment strategy to develop mangrove as tourism destination.

**Comment #3:**

The logic of the current introduction should be revised, objectives of this study need to be changed.

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4 Response #3:  
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6 We agree with this and have incorporated your suggestion throughout the manuscript. Please find some  
7 improvement in our manuscript on paragraph 4<sup>th</sup>, line 4-8 and paragraph 5<sup>th</sup>.  
8

9  
10 “In addition, analysis of carrying capacity, which is essential for mangrove ecotourism, is not sufficiently  
11 available. The last study related to carrying capacity of this area was carried out using data from 2012-  
12 2013 (Bato et al., 2013). In 2020, only research on environmental management models is available in this  
13 island without carrying capacity analysis and also not formulating a mangrove forest management  
14 strategy as a tourism destination (Sudipa, et al, 2020).”  
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16  
17 “Considering these issues, this study attempts to fill the gaps, by developing sustainable strategies for  
18 mangrove ecotourism management in Nusa Penida sacred island. By doing so, this study begins with  
19 determining carrying capacity of the mangrove ecotourism, as well as the ecological suitability of the  
20 mangrove ecosystem for tourism. The results of the study could be used as policy guidelines for local  
21 government in managing ecotourism in sacred island of Nusa Penida Bali, as well as other similar  
22 ecotourism management elsewhere.”  
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25 Comment #4:  
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27 where is title fig1?  
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29 Response #4:  
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31 I do apologize for missing the title and thank you for your comment. Therefore, as suggested by the  
32 reviewer, we have revised and put title on the figure 1.  
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### **Response to Reviewer #5**

#### **Comment #1:**

The author needs to include some empirical evidence (facts and figures) in introduction section to support and justify the issue of this study.

#### **Response #1:**

Thank you for pointing this out. We agree with this comment. Therefore, we have revised the 'introduction' section. We put some additional empirical evidence by modifying sentences that are on second paragraph, become as follows:

"Nusa Penida island in Bali Province has been designated as Marine Protected Area by local Klungkung regency in 2010 (Daulat et al 2018). The measure was supported by the Ministry of Fisheries and Marine affairs as an effort to protect mangrove forest in the area from anthropogenic pressures and other source of mangrove degradation. **Mangrove forest in this island is mostly concentrated in Jungutbatu Village of Nusa Penida islands covering an area of 194 hectares.** The mangrove forest is known for its pristine environment and attract tourists to visit the area. Based on survey conducted by Tania and Muljadi (2011), **the number of foreign tourists visiting Nusa Penida reached 200,000 people per year.** This provide an opportunity to develop and manage the mangrove area as eco-tourism area, so that the conservation and economic purposes of the mangrove management could be achieved."

#### **Comment #2:**

Motivation towards the topic/issue is not enough. The study needs to embrace more theoretical evidences in introduction section to elaborate the statement of the problem.

#### **Response #2:**

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4 Thank you for suggesting us to strengthening the motivation toward the topic. We have added  
5 sentences on third paragraph line 10-12 to elaborate the statement of the problem as follows  
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7  
8 “Unfortunately, mangrove ecosystems in Nusa Penida have not been managed as tourist destinations,  
9 so that it is necessary to study the condition of various aspect related to suitability, carrying capacity and  
10 priority strategy.”  
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14 Comment #3:

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16 Mention the source of the methodology used in table 1.  
17

18 Response #3:

19  
20 Thank you for your comments. Therefore, as suggested by the reviewer, we have revised and put source  
21 of methodology used in table1.  
22

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24  
25 Comment #4:

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27 The methodologies and their constructed values in table 1 and 2 need more  
28 explanations/interpretations.  
29

30 Response #4:

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32 Thank you for your suggestion. As suggested by the reviewer, we have explained and given more  
33 interpretations in result and discussion, such as:  
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36 “The carrying capacity arrangement was intended to maintain the authenticity and sacredness of Nusa  
37 Penida. Exceeding the carrying capacity tend to cause congestion which reduces the comfort of tourist.  
38 The most important in mangrove tourism development is facilities, activities and wildlife. Therefore, the  
39 comfort factor should be maintain.”  
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### Response to Reviewer #6:

We appreciate your helpful feedback and suggestions. Our responses are itemized in the following section

#### Comment#1:

This study investigates the tourist suitability index and carrying capacity to assess the potential of the mangrove forest on Nusa Penida Island. With a few revision, this study deserves publication.

"Based on survey conducted by Tania and Muljadi (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year."

Is there any more recent data? If this is the most recent data, it should be highlighted in the text.

#### Response #1:

Thank your for pointing this out. We put recent data becomes as follow:

**"...the number of foreign tourists visiting Nusa Penida reached 200,000 people per year but decrease in 2018 to 133, 848 people per year (Sudipa, et al, 2020)."**

#### Comment #2:

Errors in references should be fixed

"This result was supported by former research result that stated some mangrove area suitable to be ecotourism destination (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021)."

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The effort for developing mangrove area to be sustainable tourism should optimize natural resources use and respect the sociocultural characteristics of local communities. This result was supported by research result that stated some mangrove area suitable to be ecotourism destination (Chasanah, et al, 2017; Hermon, et al, 2018; Swangjang and Kornpiphat, 2021; Opa et al., 2021)

Also in the other reference.

Response #2:

Thank you for pointing this out. I agree with comment. Therefore, we have fixed it.

Comment #3:

In the conclusion section, the innovative aspect and limitations of this study should be mentioned.

Response #3:

We agree with this and have incorporated your suggestion throughout the manuscript. Please find some improvement in our manuscript on conclusion.

“This study also demonstrates a novel research approach that combine quantitative and qualitative method in assessing mangrove forest development. However, the qualitative method used needs to be developed in order to determine the priority strategy.”

—

### 3. Bukti Acceptance Artikel dan Artikel yang dipublish



# **MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA**

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Ahkmad Fauzi\*\*\*

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## **ABSTRACT**

Nusa Penida Island is one of the most famous island in Bali Province has a big potential for eco-tourism development according to the data of foreign tourists visiting Nusa Penida district which is about more than 200,000 people per year. In the other side, Nusa Penida island have an important function as a buffer zone area of Bali Island. The study was conducted to assess the potential of mangrove forest in Nusa Penida Island as an eco-tourism sacred destination. This potential was assessed by calculating the tourist suitability index and carrying capacity of mangrove forest tracking path for mangrove tour. Some development strategies were analyzed by using SWOT analysis. The results showed that Tourist Suitability Index (TSI) was 74.36 percent, implicate that the mangrove forest area in Nusa Penida Island was suitable to be developed as an eco-tourism site with the carrying capacity value for mangrove tour route of 360 tourist per day. The average of total IFAS and EFAS analysis score was 2.89 and 3.09 respectively with internal external matrix belongs in second quadrant. Some strategies of eco-tourism development in this mangrove forest are cooperating with all related stakeholders, inviting investors, improving types of tourist services such as improving all supporting facilities for eco-tourism activities, increasing the number of tourist attractions, designing plans and regulations of eco-tourism mangrove management, promoting this place to public and tourists, supervising tourist activities, and carrying out conservation-based tourist activities. However, the main strategy to restore mangrove as an ecotourism destination is improving tourist infrastructure.

Keywords: Sacred Island, Mangrove Eco Tourism, Tourist Suitability Index, SWOT analysis

## **INTRODUCTION**

According to FAO (2007), Indonesia has an area of 3,062 million hectares of mangrove forest which is about 19% of the world's mangrove forest. Mangrove forests in Indonesia have the richest

biodiversity and the most varied structures in the world (Rusila, 1999). One of mangrove forest locations in Indonesia is located in Nusa Penida Island. This mangrove forest is specifically concentrated in Jungutbatu village, Nusa Penida Island, Klungkung regency-Bali. It is an unspoiled natural forest with an area of 194 hectares (Agriculture, Plantation, and Forestry Office of Klungkung Regency, 2018). It gains a big opportunity to be developed as an eco-tourism site. Based on the data of Willingness to Pay Survey (2011), the number of foreign tourists visiting Nusa Penida reached 200,000 people per year. Considering this big number, opportunities for the development of mangrove eco-tourism in Nusa Penida island should be taken.

The institutional role in mangrove eco-tourism management in Nusa Penida has not been well-organized. Facilities and infrastructures supporting eco-tourism activities themselves have not adequate. Moreover, information center which give recent condition of mangrove forest has not yet available.

This research examined the potential of mangrove forests in Nusa Penida as a sacred and famous tourist area regarding its sustainability and feasibility or suitability to be developed as an eco-tourism site. Furthermore, development strategies which needs to be considered are also presented in this study.

## **LITERATURE REVIEW**

### **Blue Economy (BE)**

The effort for safeguarding the world oceans, water resources and coastal area are in line with the blue economy concept. This concept emphasizes the balance of community activities in long term planning (Lee, Noh, & Khim, 2020). As a small island with abundant natural resources and uniqueness of culture, its regional development program must be sustainable an improve welfare community.

### **Development Strategies**

According Rangkuti (2006), a strategy is a comprehensive master planning which explains how to achieve the predetermined goals. Strategies in the development of tourism are classified as activities to seek conformity between internal forces (strengths and weaknesses) and external forces (opportunities and threats).

### **Mangrove**

Mangrove forest is a tropical beach vegetation community, dominated by several types of mangrove trees which are able to grow and develop in strong tides and/or muddy beaches (Bengen, 2002). Vegetation of mangrove forest and its existence is determined by the influence of land and sea. Therefore, mangrove ecosystem can be found in many shallow bay beaches, delta, and estuaries.

### **Mangrove Density**

Density is the number of trees per unit area. The density of mangrove forest is one of indicators in assessing the quality of mangrove forest ecosystem itself. In addition, the density of mangrove forest is used as a parameter in determining whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007).

### **Thickness Level of Mangrove Forests**

Thickness level of mangrove forest refers to the distance of the mangrove forest from its outer line or the area which directly surrounded by sea water to mainland or association area. Findings of a research shows that mangrove forest with a thickness level of 200 meters and a density of 30 trees per 100 m<sup>2</sup> with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).

### **The Potential of Mangrove Forest for Eco-tourism**

Mangrove forests have enormous potential as a form of eco-tourism. Some forms of eco-tourism activities which can be developed are tracking, marine activities, bird watching, education, and research (Subadra, 2008 in Putra, 2014). Utilization of mangrove forest for recreation is a very rational new breakthrough needs to apply considering economic benefits which can be obtained without exploiting the mangrove itself (Kusmana and Istomo, 1993).

### **Ecological Suitability of Mangrove for Eco-tourism**

Eco-tourism activities planning should be tailored to the potential of natural resources and their allocation. An ecological suitability index can identify whether the ecosystem is highly suitable (S1), appropriate (S2), conditional (S3), or inappropriate (N) to be a tourist attraction. There are five assessment parameters on the suitability of mangrove tourism (Yulianda, 2007). These parameters are (1) thickness level of mangrove, (2) types of mangrove, (3) mangrove density, (4) sea wave, and (5) biota.

### **Carrying Capacity of the Area**

Environmental carrying capacity refers to the capacity or ability of an ecosystem to support healthy organism life while maintain productivity, adaptability, and ability to renew itself. According to Yulianda (2007), carrying capacity of an area is the maximum number of visitors which can be physically accommodated by the area provided at a certain time without causing disruption to both nature and humans.

### **Eco-tourism**

Eco-tourism is a tourist activity in an unspoiled area managed by natural rules, which aims to enjoy the beauty of scenery and promote some elements of education in order to understand and support the environmental conservation efforts and the involvement of local communities in the eco-tourism destination areas for its management (Arida, 2016).

Definition of ecotourism was first introduced by Ceballos-Lascurain in the late 1980s. Eco tourism is used to describe trips to remote natural location for the purpose of enjoying and learning the nature and culture of local population. In 1996, Ceballos-Lascurain added the use environmentally friendly technology concepts in explaining ecotourism development.

### Local Community Participation

In the development of an eco-tourism site, support and participation from the local community is obviously needed. This idea is in line with the concept of tourism development where eco-tourism development should rely on the development of local communities. A form of eco-tourism management needs to consider is community-based natural resource management. In its implementation, the community is involved starts from planning to supervision stage (Tahir and Baharudin, 2002).

## RESEARCH METHODS

### Research Location and Timetable

The research was conducted in Nusa Penida island, Klungkung regency, Bali. The research



object was 194 hectares of mangrove forest area. Meanwhile, the sampling method used was purposive sampling where participants were determined intentionally for a particular purpose local resident, village government staff and tourist. The study has been conducted for 12 months, starting from November 2017 to October 2018. The interview process was done at Nusa Penida Island.

Deep interview used questioner for guiding the discussion.

### Analysis of Ecological Suitability of Mangrove Forest

The analysis of ecological suitability of mangrove forest as an eco-tourism site was conducted through examining some parameters such as thickness level of mangrove, mangrove density, types of mangrove, sea wave, and biota. The ecological suitability of mangrove forest as an eco-tourism site was analyzed using Matrix of Conformity for Mangrove Tourism (Table 1).

Table 1. Matrix of Conformity for Mangrove Tourism

No	Parameter	Weight	Category	Score	Category	Score	Category	Score	Category	Score
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		S1	S2	S3	N					
1.	Thickness level of mangrove (m)	5	>500	3	>200-500	2	50-200	1	<50	0
2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m <sup>2</sup> )	3	>15-25	3	>10-15	2	5-10	1	<5	0
4.	Sea wave (m)	1	0-1	3	>1-2	2	>2-5	1	>5	0
5.	Biota	1	Fish, shrimps, crabs, mollusk, reptile, birds	3	Fish, shrimps, crabs, mollusk	2	Fish, mollusk	1	One of water biota	0

The formula used to calculate the conformity index for tourism can be seen in the following part:

$$CIT = \Sigma \left[ \frac{Ni}{N_{max}} \right] \times 100\%$$

where:

CIT = Conformity Index for Tourism

Ni = The value of i<sup>th</sup> parameter (weight x score)

N max = The maximum value of a tour category (39)

Classification of conformity index for mangrove eco-tourism:

S1 = Highly Suitable, with the value ranging from 83 – 100 %

S2 = Appropriate, with the value ranging from 50 – <83 %

S3 = Conditional, with the value ranging from 17 – <50 %

N = Inappropriate, with the value ranging from <17 %

### Analysis of Area Carrying Capacity (CC)

Using the concept of Area Carrying Capacity, the maximum number of visitors that can be accommodated in an area at a certain time without harming the nature and humans are shown in Table 2. Further, the analysis form of the CC calculation is as follows (Yulianda, 2007):

$$CC = K \times \frac{Lp}{Lt} \times \frac{Wt}{Wp}$$

where :

- CC = Area Carrying Capacity (people per day)
- K = The ecological potential of visitors per area unit (people)
- Lp = Area (length and width) which can be utilized (m<sup>2</sup> or m)
- Lt = Area unit for certain category (m<sup>2</sup> or m)
- Wt = Time provided by the region for tourism activities in one day (hours)
- Wp = Time spent by visitors for each particular activity (hours)

Table 2. Criteria of Carrying Capacity for Mangrove Exploration

No	Types of Activities	K (∑ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
1	Sailing	5	100 m	0,5	8

### Analysis of Development Strategies for Mangrove Eco-tourism

The technique used to create development strategy for mangrove eco-tourism was SWOT analysis. This analysis is a systematic identification of strategic factors to formulate a strategy (Rangkuti, 2006). SWOT analysis is a strategic planning method used to evaluate strengths, weaknesses, opportunities, and threats in a speculation to determine strategies by identifying internal and external factors.

- a. Analysis of internal factors (strengths and weaknesses);
- b. Analysis of external factors (opportunities and threats);
- c. IE Matrix; This matrix contains nine cell (quadrant) of strategies, where the nine cells are principally grouped into three main categories, namely: a). Growth Strategy or growth of the activities or enterprises themselves (cells #1, #2, and #5) or diversification efforts (cells #7 and 8); b). Stability Strategy or a strategy which is implemented without changing the direction of the predetermined strategy (cells #4 and 5);
- c). Retrenchment Strategy or a way to minimize and reduce the effort (cell #3, #6, and #9).

## **FINDINGS AND DISCUSSION**

### **General Condition of the Researched Area**

Administratively, Nusa Penida district belong to Klungkung Regency, which has an area of 397 hectares. In terms of land use, 221.06 hectares are used for farms (55.68%), 155 hectares for community forest (39.04%), 15 hectares for home garden (3.78%), and 5.94 hectares for others (1.50%). Jungutbatu village is situated 12 kilometres from the sub-district and 20 kilometres from the city. The village consists of 6 (six) hamlets namely Kaja I, Kaja II, Kelod I, Kelod II, Kangin I, and Kangin II.

The topography of this island is a coastal area with an altitude of 0 to 54 meters above sea level (MASL), has a climate type E (Schmidt-Ferguson) with very less rainfall (rainy season ranging from December to March), and has a temperature of 26° C - 32° C. The land condition in Jungutbatu village is less fertile with mediterranean brown (calcareous) soil type and its dominant soil depth is less than 30 cm.

The total population of Jungutbatu village in 2015 was 3,997 people, consisting of 1,983 males and 2,014 female with sex ratio of 98.46. In an area of 3.970 Km<sup>2</sup>, Jungutbatu village had a population density of 1,006.80 inhabitants/Km<sup>2</sup>, where most of its residents work as private employees (1,425 people). The education level of the population in Jungutbatu village respectively 1,549 people (38.75%) were elementary school graduates, 973 people (24.34%) were junior high school graduates, 781 people (19,54) were drop outs, 54 people (1.35%) were undergraduates or diploma graduates, and 3 people (0.08%) were graduates (Jungutbatu Village RPJMDES, 2014-2020).

### **Conformity of Mangrove Eco-tourism (CIT)**

Before developing mangrove area as a tourism site, potential resources and their allocation should be measured and identified in advance. The Conformity Index for Tourism is identifiable in the development of mangrove eco-tourism, whether the mangrove ecosystem is Highly Suitable (S1), Appropriate (S2), Conditional (S3), or Inappropriate (N). The assessment parameter of mangrove eco-tourism conformity is determined from thickness level of mangrove, mangrove types, mangrove density per 100 m<sup>2</sup>, sea wave and biota (Yulianda, 2007). Based on the results of the research, the conformity of mangrove eco-tourism in Nusa Penida is presented in Table 3.

Table 3. The Assessment of Mangrove Ecotourism Conformity in Jungutbatu Village

No	Parameter	Total Weight	Score	Category	Score	CIT (%)
1	Thickness level of mangrove (m)	5	2	S2	10	25,64
2	Types of mangrove	3	3	S1	9	23,08
3	Mangrove density (100 m <sup>2</sup> )	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
<b>TOTAL</b>						<b>74,36</b>

Based on Table 3, it can be explained that the thickness of mangrove in Nusa Penida Island has a value of 10 with an CIT value of 25.64%. The existing mangrove types has a value of 9 with CIT value of 23.08%, indicating that the mangroves have a rich diversity. Similarly, the mangrove density per 100 m<sup>2</sup> has a value of 6 with CIT value of 15.38%. The sea wave is very volatile with the value of 1 and CIT value of 2.56, thus it has the category of "Conditional". Its biota has the category of "Highly Suitable" with IKW value of 7.60% where biodiversity is extremely rich. After the analysis, CIT results obtained was 74.36%, indicating that the mangrove forest area in Nusa Penida Island is in the category of Appropriate/S2 (50 - <80%).

### Area Carrying Capacity (CC)

The results of measurement and observation in the field found that the length of sailing path was 450 meters. The time required for sailing with a boat with the capacity of 5 people and 1 sailor was 30 minutes. The time provided for mangrove exploration activities in a day is 8 hours.

Based on the area carrying capacity (CC), the maximum people joining the sailing path which can be accommodated are 360 people per day approximately for 8 hours. With the number of tourist visits, an average of 50 people per day, mangrove activity in Nusa Penida Island can still be improved. In certain months, the number of visits increased, as of July to September where it reached 400 tourists per day. This condition should receive serious attention by the mangrove tour managers. If the number of visits exceeds the maximum carrying capacity, activities should be arranged shifting each other or turned into another activities such as snorkeling or diving. These efforts should be done to avoid negative impacts on mangrove ecosystem in Nusa Penida Island.



## The Results of Internal Factor Strategic Analysis Summary (IFAS) and External Factor Strategic Analysis Summary (EFAS)

The potential of the mangrove area in Nusa Penida Island has the opportunity to be developed as an eco-tourism site, yet there are also various weaknesses or problems and threats in the implementation which demands serious attention from the manager.

The results of Internal Factor Analysis Summary (IFAS) consist of strengths and weaknesses of mangrove eco-tourism development in Nusa Penida Island, where the highest strength factor gained by natural beauty, density, vegetation type, and biodiversity of mangrove forest with a score of 0.33. It shows that the panorama beauty of mangrove forest, its density, mangrove vegetation types, and existing biodiversity have dominant power in eco-tourism development of mangrove eco-tourism.

It was also identified that the highest weakness factor is the inadequate supporting facilities and infrastructures for eco-tourism activities with the score of 0.23. It indicates that among the existing weakness factors, supporting facilities and infrastructures are perceived to have the least disadvantage.

The results of External Factor Analysis Summary (EFAS) which consist of opportunities and threat factors of mangrove eco-tourism development discover that the highest probability factor is the opening of new job alternative to increase the income of local community and the festival of Nusa Penida with the score of 0.33. Tourism activities in Nusa Penida, especially in centre of mangrove, Jungutbatu village provide opportunities for new jobs and this condition has a positive impact the income of local community.

The threat factor which gains the highest score is competition with other attractions with a score of 0.29. This finding showed that the existence of mangrove eco-tourism potentially compete with other tourism objects in Bali.

From the results of internal environmental factor analysis, it was found that the development of mangrove eco-tourism is in the "Average" position with an average score of 2.89. Meanwhile, the external factor analysis is in the "High" position with an average score of 3.09. The merger of these two analyses (IFAS and EFAS) results in the strategies shown in the IE Matrix (see Table 4).

Table 4. IE Matrix

		<b>TOTAL SCORE OF INTERNAL FACTORS</b>			
		<b>STRONG</b>	<b>AVERAGE</b>	<b>WEAK</b>	
		4,0	3,0	2,0	1,0
HIGH	3,0	I Growth Concentration through Vertical Integration	II Growth Concentration through Horizontal Integration	III Retrenchment Turn Around	
	AVERAGE				
	2,0				
	WEAK				

IV Stability Carefulness	V Growth Concentration through Horizontal Integration Stability No Change of Strategic Profit	VI Retrenchment Captive Company or Divestment
VII Growth Concentric Diversification	VIII Growth Conglomerate Diversification	IX Retrenchment Bankrupt or Liquidation

Based on Table 4, the development of mangrove eco-tourism is presented in cell II, namely Growth (concentration through horizontal integration). This position illustrates that in order to develop mangrove eco-tourism through exploring the opportunities and strengths, strategies need to be built are the following:

- a. Building cooperation with all stakeholders related to mangrove eco-tourism development, including promotion, will involve local government of Klungkung regency, central government for improvement of human resource quality (e.g. education and training), and Non-Governmental Organizations (NGOs) in the implementation and supervision of eco-tourism activities and their promotion as a tourism area.
- b. Inviting investors to develop mangrove eco-tourism especially to build its development facilities, to determine the pattern of eco-tourism mangrove development including conducting study on environmental impacts of mangrove eco-tourism development. However, upgrading environmentally infrastructure in coastal area inline with mangrove restoration. These program making coastal communities more safe and suitable with IUCN (2017).
- c. Providing services to tourists in forms of facilities and infrastructures that supports the mangrove eco-tourism: construct a walk board as a diversification of mangrove eco-tourism, bird watching towers, vehicle parking facilities, checkpoints, information post, and hygienic toilet facilities.
- d. Designing plan and regulation of mangrove eco-tourism management: arranging spatial plan of mangrove eco-tourism management and making regulations about mangrove eco-tourism management as well as stated by Pons and Fiselier (1991) and suitable with blue economy (Lee et al., 2020).
- e. Monitoring and carrying out conservation-based tourism activities: calculating the area carrying capacity, monitoring waste caused by tourism activities, imposing restrictions on tourist activities that could damage the mangrove ecosystem, rehabilitating degraded mangrove areas, and planting the mangrove areas that have less density.

## CONCLUSIONS AND RECOMMENDATIONS

## Conclusions

Based on the results of research and analysis of internal and external factors of mangrove eco-tourism development in Nusa Penida island, some conclusions can be formulated as follows:

1. The potential of mangrove eco-tourism area:
  - a. Conformity Tourism Index indicates that the mangrove forest is suitable to be developed as an eco-tourism site.
  - b. Area Carrying Capacity or the maximum ability of mangrove tracking tour to accommodate tourists are 360 people for 8 hours each day.
2. The Main Strategies for mangrove eco-tourism development which can be done are presented in the following part:
  - a. Cooperating with all stakeholders related to mangrove eco-tourism development including doing promotion.
  - b. Inviting investors for the development of mangrove eco-tourism.
  - c. Increasing the types of services for tourists such as improving supporting facilities for eco-tourism activities.
  - d. Creating design plan and regulation of mangrove eco-tourism management.
  - e. Monitoring the tourist activities and implementing conservation-based tourist activities.

## Recommendations

1. Further research is needed to investigate the fauna potential in Nusa Penida mangrove area and the perception of tourists, tourism actors, and government related to mangrove eco-tourism development.
2. It takes the role of government in preparing human resources to work in the field of tourism in order to improve the economy of the local community.
3. To make this development more comprehensive, quantitative research is needed thus more appropriate strategies can be analyzed.

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