BUKTI KORESPONDENSI

ARTIKEL JURNAL INTERNASIONAL BEREPUTASI Q1

Judul Artikel : Developing Mangrove Eco-Tourism In Nusa Penida Sacred Island, Bali, Indonesia

Jurnal : Environment, Development and Sustainability, 26, 535–548 (2024)

https://doi.org/10.1007/s10668-022-02721-9

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No	Perihal	Tanggal
1	Bukti konfirmasi submit artikel dan artikel yang disubmit	19 Desember 2019
2	Bukti konfirmasi review dan hasil review pertama	(1) 2 Januari 2022 (2) 10 Juni 2022 (3) 3 September
	Bukti respon kepada reviewer, dan artikel yang diresubmit.	(1) 18 April 2022 (2) 17 Juli 2022 (3) 10 Oktober 2022
3	Bukti konfirmasi artikel accepted	13 Oktober 2022
4	Bukti konfirmasi artikel published online	22 Oktober 2022
5	Lisensi dari publisher Tanggal Issue	19 Oktober 2022 24 Januari 2024

1. Bukti konfirmasi submit artikel dan artikel yang disubmit

Environment, Development and Sustainability (ENVI)

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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^2 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 S1	Score	Category S2	Score	Category S3	Score	Category N	Score
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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	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.
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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Environment, Development and Sustainability

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

--Manuscript Draft--

Manuscript Number:	ENVI-D-19-00627R1
Full Title:	MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA
Article Type:	Original paper
Keywords:	Sacred Island; Mangrove Eco Tourism; Tourist Suitability Index; SWOT Analysis
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Funding Information:	
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.
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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

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

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^2 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 S1	Score	Category S2	Score	Category S3	Score	Category N	Score
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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a

population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	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)

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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2.	Types of mangrove	3	>5	3	3-5	2	1-2	1	0	0
3.	Mangrove density (100 m^2)	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

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No	Types of Activities	K (∑ Visitors)	Area Unit (Lt)	Time Needed Wp (hours)	Total Duration in a Day Wt (hours)
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Table 4. Internal External Matrix

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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

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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).

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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).

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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.

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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).

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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 S1	Score	Category S2	Score	Category S3	Score	Category N	Score
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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	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)
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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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.

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

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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, the are several critical point that should be carrying 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 thats 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 (kementrian lingkungan hidup, lementria kelautanperikanan dan kementrian 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 (Yulianda, 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--

Manuscript Number:	ENVI-D-19-00627R2
Full Title:	MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA
Article Type:	Original paper
Keywords:	Sacred Island; Mangrove Eco Tourism; Tourist Suitability Index; SWOT Analysis
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Funding Information:	
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.
Response to Reviewers:	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.

Title Page W/All Author contact Info

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

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 Density

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 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^2 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). In accordance with the regulation of tourism affair number 33, 2009, the regional development of ecotourism in Bali has to maintain the existence of ecological and also improve the community welfare.

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 S1	Score	Category S2	Score	Category S3	Score	Category N	Score
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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	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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3.	Mangrove density (100 m^2)	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

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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

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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.

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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^2)	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^{th} 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 %

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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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	III Retrenchment Turn Around
AVERAGE 2,0			
WEAK			

IV Stability Carefulness	V Growth Concentration though 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^2 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.

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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.

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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.

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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.

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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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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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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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	III Retrenchment Turn Around
AVERAGE 2,0			
WEAK			

IV Stability Carefulness	V Growth Concentration though 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.

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

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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/10.1007/s12665-021-10071-4
https://doi.org/10.1007/s41324-018-0166-2
More articles should be discussed, especially among the international literature.
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--

Manuscript Number:	ENVI-D-19-00627R2
Full Title:	MANGROVE ECO-TOURISM DEVELOPMENT AT NUSA PENIDA SACRED ISLAND IN BALI, INDONESIA
Article Type:	Original paper
Keywords:	Sacred Island; Mangrove Eco Tourism; Tourist Suitability Index; SWOT Analysis
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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.
Response to Reviewers:	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.

Title Page W/All Author contact Info

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

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 Density

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 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^2 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). In accordance with the regulation of tourism affair number 33, 2009, the regional development of ecotourism in Bali has to maintain the existence of ecological and also improve the community welfare.

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 S1	Score	Category S2	Score	Category S3	Score	Category N	Score
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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	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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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^2)	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

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	TOTAL					**74,36**

Table 4. Internal External Matrix

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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^2 with 15 cm trees diameter can reduce about 50% of tsunami wave energy (Dahuri, 1996).

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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).

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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).

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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. 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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	III Retrenchment Turn Around
AVERAGE 2,0			
WEAK			

IV Stability Carefulness	V Growth Concentration though 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.

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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--

Manuscript Number:	ENVI-D-19-00627R3
Full Title:	DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA
Article Type:	Original paper
Keywords:	Mangrove Eco Tourism; Sacred Island; SWOT analysis; Tourist Suitability Index
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Funding Information:	
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. 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.
Response to Reviewers:	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.

Title Page W/All Author contact Info

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. 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.

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

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, mangrove forests provide coastal protection, enhance costal 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 averae of 0.18% per year with aquaculture accounting for 30% of this total forest change. In response to such a problem, government in many developing countries have developed various measures to protect

mangrove forests such as mangrove conservation, establishing marine protected areas, or designating mangrove forests as ecotourism areas. Such a measure has been implemented in Nusa Penida mangrove forest in Bali Indonesia.

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.

One of the challenging issues of managing mangrove ecotourism, however, is how to develop a comprehensive assessment strategy to develop mangrove as tourism destination. Up until now, such a management is lacking. The institutional arrangement of the ecotourism has net been developed yet. In addition, analysis of carrying capacity, which is essential for mangrove ecotourism, is not yet available.

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.

LITERATURE REVIEW

Blue Economy (BE)

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

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^2 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 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 S1	Score	Category S2	Score	Category S3	Score	Category N	Score
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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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. 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 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

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 carryng 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 conservation-based tourist activities are factors that need to be considered for sustainable ecotourism in the area.

Recommendations

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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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
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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.

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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 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?

"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 revierwer 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).

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--

Manuscript Number:	ENVI-D-19-00627R4
Full Title:	DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA
Article Type:	Original paper
Keywords:	Mangrove Eco Tourism; Sacred Island; SWOT analysis; Tourist Suitability Index
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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. 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.
Response to Reviewers:	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 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: 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 revierwer 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.

Title Page W/All Author contact Info

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. 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 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 recommendation are proposed. These include improving tourist infrasructure, 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: Mangrove Eco Tourism; Sacred Island; SWOT analysis; Tourist Suitability Index

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 costal 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 a problem, government in many developing countries have developed various measures to protect

mangrove forests such as mangrove conservation, establishing marine protected areas, or designating mangrove forests as ecotourism areas. Such a measure has been implemented in Nusa Penida mangrove forest in Bali Indonesia.

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.

One of the challenging issues of managing mangrove ecotourism, however, is how to develop a comprehensive assessment strategy to develop mangrove as tourism destination. Up until now, such a management is lacking. The institutional arrangement of the ecotourism has net been developed yet. In addition, analysis of carrying capacity, which is essential for mangrove ecotourism, is not yet available.

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.

LITERATURE REVIEW

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 eco system can be found in many shallow bay beaches, delta, and estuaries.

Mangrove forests have enormous potential to be developed as eco-tourism sites. 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.

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^2 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

whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007). 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.

Other factors that drive the ecotourism as sustainable solution to prevent mangrove degradation is the consideration of benefits derived from ecotourism. Fries (2017) noted that mangrove ecotourism has a number of potential benefits to local communities. These include direct financial benefits from ecotourism as well as livelihood diversification providing different employment opportunities. Mangrove ecotourism would also encourage the growth of local entrepreneurship and increase local skill and training due to demand from tourism activities. In addition to economic benefits, mangrove ecotourism would also promote local culture as well as empower marginalized section of the coastal communities.

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).

Managing mangrove ecotourism sustainably requires a comprehensive strategic assessment. There numerous approaches to address this issue. One of the most popular ones is to use qualitative method such as SWOT analysis combined with other methods. For example, Murtini et al (2018) use SWOT analysis to develop ecotourism strategies in Wonorejo, Surabaya Indonesia. Their findings are in line with other studies that emphasize strong committement both from the government as well as from the communities to support sustainable tourism. According Rangkuti (2006), a strategy is a comprehensive master planning which explains how to achieve the predetermined goals. Strategies 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.

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 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 S1	Score	Category S2	Score	Category S3	Score	Category N	Score
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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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

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 destination (Hermon, Ganefri, & Oktorie, 2018; Swangjang & Kornpiphat, 2021); (Opa et al., 2021).

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. 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 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.

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).

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 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 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 carryng 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

conservation-based tourist activities are factors that need to be considered for sustainable ecotourism in the area.

Recommendations

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 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

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".

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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 revierwer 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).

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Authors' response to reviewers' comments

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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:

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 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."

Environment, Development and Sustainability

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

--Manuscript Draft--

Manuscript Number:	ENVI-D-19-00627R5
Full Title:	DEVELOPING MANGROVE ECO-TOURISM IN NUSA PENIDA SACRED ISLAND, BALI, INDONESIA
Article Type:	Original paper
Keywords:	Mangrove Eco Tourism; Sacred Island; SWOT analysis; Tourist Suitability Index
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Funding Information:	
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. 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.
Response to Reviewers:	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

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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 apologized for missing the title and thank your 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.”

Title Page W/All Author contact Info

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 witin the second quadrant of SWOT matrix. Several strategies recommendation are proposed. These include improving tourist infrasructure, 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 costal 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

a problem, government in many developing countries have developed various measures to protect mangrove forests such as mangrove conservation, establishing marine protected areas, or designating mangrove forests as ecotourism areas. Such a measure has been implemented in Nusa Penida mangrove forest in Bali Indonesia.

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 but decrease in 2018 to 133, 848 people per year (Sudipa, et al, 2020). 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. 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.

One of the challenging issues of managing mangrove ecotourism, however, is how to develop a comprehensive assessment strategy to develop mangrove as tourism destination. Up until now, such a management is lacking. The institutional arrangement of the ecotourism has not been developed yet. 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, there is 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.

LITERATURE REVIEW

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 eco system can be found in many shallow bay beaches, delta, and estuaries.

Mangrove forests have enormous potential to be developed as eco-tourism sites. 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.

There are numerous activities which can be developed in mangrove ecotourism area such tracking, marine activities, bird watching, education, and research (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^2 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 whether or not a mangrove forest should be used as an eco-tourism site (Yulianda, 2007). 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.

Other factors that drive the ecotourism as sustainable solution to prevent mangrove degradation is the consideration of benefits derived from ecotourism. Fries (2017) noted that mangrove ecotourism has a number of potential benefits to local communities. These include direct financial benefits from ecotourism as well as livelihood diversification providing different employment opportunities. Mangrove ecotourism would also encourage the growth of local entrepreneurship and increase local skill and training due to demand from tourism activities. In addition to economic benefits, mangrove ecotourism would also promote local culture as well as empower marginalized section of the coastal communities.

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).

Managing mangrove ecotourism sustainably requires a comprehensive strategic assessment. There numerous approaches to address this issue. One of the most popular ones is to use qualitative method such as SWOT analysis combined with other methods. For example, Murtini et al (2018) use SWOT analysis to develop ecotourism strategies in Wonorejo, Surabaya Indonesia. Their findings are in line with other studies that emphasize strong committement both from the government as well as from the communities to support sustainable tourism. According Rangkuti (2006), a strategy is a comprehensive master planning which explains how to achieve the predetermined goals. Strategies 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.

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 S1	Score	Category S2	Score	Category S3	Score	Category N	Score
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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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. 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);
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 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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 (Yulianda, 2007). Similarly, the mangrove density per 100 m^2 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 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)

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 higher than previous study which only reach 122 people per day (Bato et al., 2013). 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 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. Figure 2 show natural tourism destination in Nusa Penida.

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.

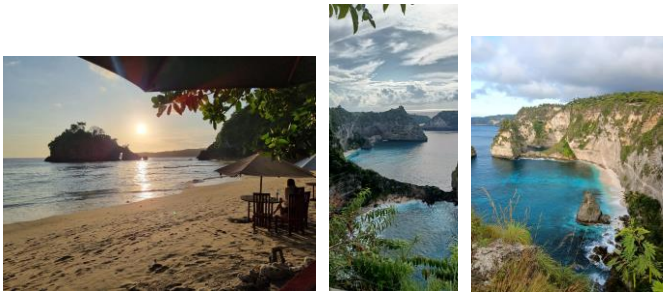

Figure 2. The Sacred Natural Island Nusa Penida, Bali, Indonesia

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).

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 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. 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.

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 360 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 conservation-based tourist activities are factors that need to be considered for sustainable ecotourism in the area.

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.

Recommendations

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.

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 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 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:

"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."

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 #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.”

—

3. Bukti Acceptance Artikel dan Artikel yang dipublish

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^2 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^2)	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^{th} 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^2 or m)

Lt = Area unit for certain category (m^2 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^{o} C - 32^{o} 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^2, Jungutbatu village had a population density of 1,006.80 inhabitants/Km^2, 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^2, 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^2)	3	2	S2	6	15,38
4	Sea wave (m)	1	1	S3	1	2,56
5	Biota	1	3	S1	3	7,69
	TOTAL					**74,36**

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^2 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	**II** **Growth** **Concentration through Horizontal Integration**	III Retrenchment Turn Around
AVERAGE 2,0			
WEAK			

IV Stability Carefulness	V Growth Concentration though 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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