JURNAL SEGARA
http://ejournal-balitbang.kkp.go.id/index.php/segara

ISSN : 1907-0659
e-ISSN : 2461-1166
Acreditation Number : 158/E/KPT/2021

STUDY OF CARRYING CAPACITY AND DEVELOPMENT STRATEGY OF CORAL GARDEN BASED ECOEDUTOURISM IN CEMARA BESAR ISLAND, KARIMUNJAWA NATIONAL PARK, JEPARA, CENTRAL JAVA

Yeremia Edgar Aprilio[1)], Muhammad Arif Asadi[1)], & Yulius[2)]

[1)]Brawijaya University
[2)]Research Center for Conservation of Marine and Inland Water Resources,
Research Organization for Earth Sciences and Maritime, National Research and Innovation Agency

Received: 20 May 2022; Revised: 16 December 2022; Accepted: 20 August 2022

ABSTRACT

Cemara Besar Island, Karimunjawa National Park, is an important tourist destination in the province of Central Java due to its beautiful beaches and coral reefs. The purpose of this study was to see the area carrying capacity for ecoedutourism based on coral gardens in Cemara Besar Island, analyze development strategies, and find out the recommended spots. The carrying capacity of the area is calculated using three considerations: Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC) and Effective Carrying Capacity (ECC). The results, in PCC>RCC>ECC format, are 2472>97>42 people per day in the utilization zone while 670 > 30 > 15 people per day in the protection zone. Using SWOT analysis, the analysis of tourism development strategies produced 15 alternative regional development strategies, with the top strategic priority being "the development of the concept of coral garden tourism". Observations on five recommended spots were carried out using a time swimming method, by snorkeling for 10 minutes in an area of 10 m × 10 m per point. The two recommended points in the northern east side of the island, points B and D, are designated as the highly recommended points to apply the concept of ecoedutourism based on coral garden because in these two points the condition of coral reefs is not too good and requires restoration.

Keywords: Cemara Besar Island, Tourism Development, Coral Reefs, PCC, RCC, ECC, SWOT Analysis.

Corresponding author:
Jl. Pasir Putih I Ancol Timur, Jakarta Utara 14430. Email: yulius.lpsdkp@gmail.com

INTRODUCTION

Tourism is one of the industrial and business sectors that has the highest growth index in the world. The growth of the tourism sector globally shows a figure of 4% per year (WTO, 2000), while the growth of Indonesia national tourism sector has touched 8% per year since the launching of the Wonderful Indonesia program by highlighting local brands and local tourist destinations that are still natural (Kemenpar, 2016). Along with advances in science and technology, it is now easier for tourists to determine their tourist destinations. This condition can be used as an opportunity for areas that have tourism potential. The utilization of tourism potential will have impacts on increasing the regional income and community welfare (Kumaat *et al*., 2017). Tourism development is one way of developing an area or region. This tourism development cannot be separated from the existence of natural resources and artificial resources as regional potential owned by an area or region. The potential of the area is one of the leading sources of tourism assets, in the form of both natural beauty or cultural heritage of the past (cultural tourism) and superior commodities that are unique to the region (Lintong *et al*., 2019).

One alternative tourism that can be done is the coral garden program tour. Coral garden is defined as a coral reef restoration activity in an area that does not have coral cover for some reason using sexual methods and asexual methods such as transplantation (Epstein *et al*., 2001). In this location, the coral gardens are made of iron framework in the form of a hemispherical dome that are attached by various life forms of living coral fragments. The fragments are tied using cable ties to prevent them from falling under the current. A good method used in making coral gardens is the PRA or Participatory Rural Appraisal approach, which involves the local community in making the coral gardens (Luthfi, 2016).

Tourism development can be done with the concept of ecoedutourism. Ecoedutourism is an environmental-based tourism activity that is packaged in an educational project. Ecoedutourism was developed from Education and Ecotourism. Education in ecoedutourism is one way of learning that can be launched by managers through an ecotourism activity (Nugroho, 2011). Ecotourism itself is an environmental conservation and rescue activity that is packaged in tourist trips to natural areas so that they are able to provide livelihoods for local residents (Yulius *et al*., 2018). Ecoedutourism has enormous potential to be used as an environmental learning method that can be applied in schools. (Setiawan & Hutagaol, 2017).

An analysis of the carrying capacity of the area is carried out to determine the maximum number of visitors that can be tolerated in a tourist area. The value of the carrying capacity of the area is very important to know so that tourism activities can take place comfortably and sustainably, which the preservation of the area is maintained. Depending on certain types of tourism, the value of the carrying capacity of the area can vary depending on the area of tourism activities and the correction factor (Pasak *et al*., 2017).

This study aims to estimate the area carrying capacity, analyze development strategies for program development, and find out the recommended spots for ecoedutourism based on coral garden in Cemara Besar Island.

.

METHODOLOGY

In this study, the recommended area data was taken using the observation method, which is a way of collecting data by direct observation and systematic recording of the object to be studied. Observations were carried out by researchers by observing and recording the condition of the location that had been determined and considered to have the potential for ecoedutourism points based on coral gardens so that recommendations for tourist areas could be generated.

Based on the coordinate map of the recommended points for the coral garden tourism area, there are 5 coordinate points symbolized by point A, point B, point C, point D, and point E. Point A has coordinates -5.80624, 110.3783; point B has coordinates -5.80314, 110.38081; point C has coordinates -5.79874, 110.37475; point D has coordinates -5.80106, 110.38201; and point E has coordinates -5.79527, 110.38012 (Figure 1).

Data Collecting Method

The data used in this study are primary data and secondary data. Secondary data collection was done by collecting documents from related journals and the results of studies/research from related agencies. Primary data was obtained from direct observation in the field. Primary data in the form of a questionnaire was used as a tool in the process of identifying the value of benefits and the value of the present condition.

Water Quality Data

Water quality data was obtained from direct observation in the field. Measurement of water quality to determine the condition of coral reefs around the waters of Cemara Besar Island. The measured water quality parameters are temperature, turbidity, pH and salinity.

Carrying Capacity Analysis Method

The observation of the condition of coral reef tourism recommended points based on coral gardens

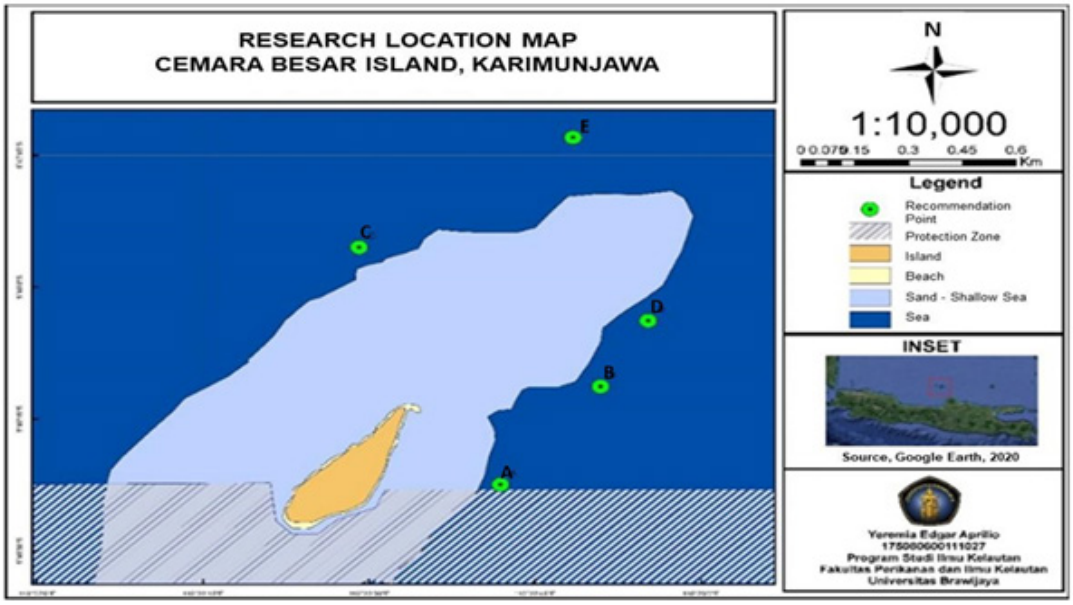

Figure 1. Research Location Map.

was carried out by the time swimming method or exploring using a snorkel. This method is carried out by researchers by diving near the surface of the water with a certain time span (10-30 minutes per point) at coordinates with an area of 10 × 10 m per point that has been determined to make a brief identification of coral species and the presence of biota associated with coral reefs and research documentation.

There are five parameters used by researchers in determining the recommendation for coral garden tourism points, namely the condition of coral reefs, pelagic biota conditions, demersal biota conditions, water brightness conditions, and current conditions.

The method introduced to calculate the carrying capacity of natural ecotourism development is the concept of Regional Carrying Capacity (RCC). The calculation of Regional Carrying Capacity is based on consideration of three main levels, namely physical carrying capacity (PCC), real carrying capacity (RCC) and effective carrying capacity (ECC). PCC is calculated using the following formula:

$$PCC = A \times \frac{V}{a} \times Rf$$

where,
A = area available for tourism use,
V = a tourist,
a = area needed by tourists, and
Rf = Rotation Factor of Wp/Wt where, Wp = time spent by visitors for each specific activity, Wt = time provided by the Region for tourist activities in one day (Simanjuntak *et al*., 2015). RCC is calculated using the following formula:

$$RCC = PCC \times Cf1 \times Cf2 \times Cf3 \ldots \times Cfn$$

$$Cfn = 1 - \left(\frac{Lm}{Tm}\right)$$

where,
Cf = Correction Factor,
Lm = limiting magnitude of the variable, and
Tm = total magnitude (total magnitude) of the variable (Herlambang *et al*., 2016)

ECC=RCC×MC

$$MC = \frac{existing\ employees}{staff\ needed} \times 100\%$$

Notation RCC = Real Carrying Capacity, and
MC = Management correction factor.

The strategies for developing coral reef tourism in Cemara Besar Island can be determined using a SWOT analysis through an analysis of the Benefit Level (TM) and Current Condition (KS).

The SWOT analysis was carried out as follows:

1. Identify key factors. Key factors in this study include Natural Resources (NR), Human Resources (HR), infrastructure, regulations, and potential tourists.
2. Determine the key person for conducting interviews or filling out questionnaires so that the determination of the SWOT class can be done subjectively.
3. Identification of internal and external factors based on factor weight analysis from interviews or

questionnaires.

The method of determining internal and external strategic factors is as follows (Simanjuntak *et al*., 2015);

1. Determine the factors that are the strengths and weaknesses of coral reef tourism development activities on Cemara Besar Island.
2. Giving weight to each of these factors according to their level of importance or level of benefit. The weight is generated from the average level of benefit of each factor divided by the average number of levels of benefit of all factors then multiplied by 100%. The sum of all weights must be 100% or 1.00 using a paired comparison table in the IFE and EFE matrices (Basuki, 2005)
3. Calculate the rating or suitability value for each factor based on the influence/response of these factors on the development of mangrove tourism on Kemujan Island (score: 5 = very suitable, 4 = suitable, 3 = quite suitable, 2 = not suitable, 1 = very inappropriate).
4. Multiply the weight by the rating or Conformity Value to obtain a weighted score for each factor.

After obtaining the internal factors and external factors and identifying their weaknesses and strengths, then these factors are linked in a SWOT matrix to obtain alternative strategies (Table 1).

Furthermore, after obtaining alternative strategies, then the alternative strategies are sorted by priority through the calculation of scores by adding up the total score of the factors involved in an alternative strategy.

After obtaining strategic priorities, the determination of alternative management strategies is calculated to show the condition or situation of the agency or area against known alternative strategies. Alternative management strategies are divided into 4 quadrants where the results depend on :

X axis (the difference in scores of internal factors between strengths and weaknesses) and

Y axis (the difference in scores of external factors between opportunities and threats) (Putridhanti, 2013).

RESULTS AND DISCUSSION

Water Quality

Observations of water parameters at 5 recommendation points were also carried out together with the survey team of the Jakarta Marine Research Center. Observational data can be seen as follows (Table 2).

Temperature

The results of temperature measurements in the waters of Cemara Besar Island show a relatively similar number, namely 29.5oC. The measurement results show good water temperature results where the optimum temperature for coral reefs is 25-30oC, because most corals will lose their ability to catch food at temperatures <16oC and >33.5oC (Tito *et al*., 2013)

Turbidity

Turbidity measurements showed relatively the same number at 0 NTUs. The measurement results show that the waters around Cemara Besar Island are very clean and not cloudy. Turbidity directly affects coral reefs because the grains of sediment that are uplifted

Table 1. SWOT Matrix

Internal	**Strength (S)**	**Weakness (W)**
Eksternal	**Internal Strength Factor**	**Internal Weakness Factor**
Opportunity (O) External Strength Factor	Strategy S-O (Strategy using strengths to take advantage of opportunities)	Strategy W-O (Strategies to minimize weaknesses to take advantage of opportunities)
Threat (T) External Weakness Factor	Strategy S-T (Strategies using strength to overcome threats)	Strategy W-T (Strategies using strength to overcome threats)

Source: Simanjuntak (2015)

Table 2. Recommended Points and Water Quality Data

Station	Latitude	Longitude	Time	Turb	pH	Temperature	Salinity
A	-5.80624	110.3783	9.34	0	7.75	29.5	31.3
B	-5.80314	110.38081	9.39	0	7.92	29.5	31.3
C	-5.79874	110.37475	9.54	0	7.82	29.5	31.4
D	-5.80106	110.38201	10.14	0	7.67	29.5	31.4
E	-5.79527	110.38012	10.30	0	7.86	29.5	31.4

and are no longer floating will settle to the bottom of the water, these grains will cover coral polyps which can cause corals to be stressed. Meanwhile, the turbidity indirectly through the sediment grains will affect the zooxanthellae microalgae which are symbiotic with corals by blocking the intensity of sunlight as a photosynthesis material (Rauf *et al*., 2015).

pH

The measurement results show a number that is not much different between 7.67 – 7.92. The pH measurement results show a stable number so that the pH of the waters can be said to be good because changes in pH affect the chemical and biological processes of organisms in the waters. pH affects the toxicity of a chemical compound in the waters. The pH value greatly affects the biochemical processes of the waters (Rauf *et al*., 2015).

Salinity

Based on the measurement results, it can be seen that the salinity of the waters at the recommendation point shows the results of 31.3 – 31.4‰. The measurement results show a good number between 29 - 33‰, this is because if the salinity drops it will affect coral fertility by up to 86%. Salinity is able to affect the respiratory system and the rate of photosynthesis of corals by decreasing the amount of chlorophyll per algae per cell (Rauf *et al*., 2015).

From the observations, it can be concluded that the recommendation points for coral garden ecoedutourism with the recommendation matrix are as follows (Table 3).

Table 3. Recommendation Table Matrix

No	Parameter	Point A	Point B	Point C	Point D	Point E
1	Coral Reefs	√	-	√	-	√
2	Pelagic Biota	√	√	-	-	√
3	Demersal Biota	-	-	√	-	-
4	Turbidity	√	√	√	-	√
5	Current Condition	√	√	-	√	√
Conclusion		Not recommended for coral garden tourism program, but recommended for snorkeling and diving tourism programs	Recommendations for coral garden tourism programs but not recommendations for snorkeling and diving tourism programs.	Not recommended for coral garden tourism program, but recommended for snorkeling and diving tourism programs	Recommendations for coral garden tourism programs but not recommendations for snorkeling and diving tourism programs	Not recommended for coral garden tourism program, but recommended for snorkeling and diving tourism programs

Table 4. Internal Strategy Factors

Internal Strategy Factors	ID	Value Current Condition	Benefit Rate Value	Information
Strength				
1. Density of coral reefs on Cemara Besar Island	A	3.75	4.25	Priority Maintained
2. Diversity of Coral Reefs	B	3.50	4.25	Priority Maintained
3. Diversity of Aquatic Biota	C	3.50	4.50	Priority Maintained
4. Quality of human resources in handling domestic tourists	D	3.50	4.50	Priority Maintained
5. Quality of human resources for education and conservation tourism	E	3.50	4.25	Priority Maintained
6. Area Cleanliness	F	3.75	4.00	Priority Maintained
7. Accessibility to coral tourism areas	G	3.50	4.00	Priority Maintained
8. Reef tourism facilities	H	3.50	4.00	Priority Maintained
Weakness				
1. Presence of Dangerous Biota	I	2.75	2.25	Not a Development Priority
2. Condition of coral reefs on Cemara Besar Island	J	3.00	4.75	Development Priority
3. Coral Reef Tourism	K	3.00	3.75	Development Priority
4. The Presence of Typical Animals	L	2.50	3.75	Development Priority
5. Existence of Area Management	M	1.75	4.75	Development Priority
6. The quality of human resources in handling foreign tourists	N	3.00	4.75	Development Priority

There are two points that are recommended as the application of the concept of ecoedutourism based on coral gardens, namely point B and point D because in these two areas the condition of coral reefs is not too good and requires restoration. After obtaining the recommended points, then looking for alternative development strategies through SWOT analysis (Table 4 and Table 5). After that, scoring is done using the IFE and EFE matrix (Table 6 and Table 7).

The IFE matrix (Table 6) shows that the total score on the strength factor is 2,222 which is greater than the total score on the weakness factor of 1,946. This shows that in the management of tourism potential and resources on Cemara Besar Island, the strength factor is more influential than the weakness factor. The EFE matrix (Table 7) shows that the total score on the opportunity factor is 2,466 which is greater than the total score on the threat factor of 1,599. This shows that in the management of tourism potential and resources on Cemara Besar Island, the opportunity factor is more influential than the threat factor.

After knowing the IFE and EFE matrices, then looking for the alternative strategies through the SWOT matrix (Table 8);

Table 5. External Strategy FactorData

External Strategy Factors	ID	Value Current Condition	Benefit Rate Value	Information
Opportunities				
1. Potential for domestic tourists	O	4.25	4.50	Priority Maintained
2. The potential of foreign tourists	P	3.75	4.25	Priority Maintained
3. Security of tourist sites (criminality)	Q	4.25	4.50	Priority Maintained
4. Availability of Communication Facilities	R	4	4.75	Priority Maintained
5. The existence of special souvenirs	S	2.50	3.50	Priority Maintained
6. Community support for coral reef tourism	T	4.25	4.50	Priority Maintained
7. Condition of electricity infrastructure	U	2.50	3.50	Priority Maintained
8. Cemara Besar Island tourism promotion	V	3.50	4.00	Priority Maintained
9. The existence of law enforcement or sanctions against environmental destroyers	W	3.75	4.00	Priority Maintained
10. Worthy means of transportation	X	3.50	4.25	Priority Maintained
11. Adequate means of transportation	Y	4.25	4.25	Priority Maintained
12. Condition of infrastructure leading to tourist areas (waves, etc.)	Z	3.50	3.50	Priority Maintained
13. Logistics supply (foodstuffs, etc.)	A1	3.25	3.50	Priority Maintained
14. Existence of interesting culinary tourism	B1	3.25	4.25	Priority Maintained
15. Availability of facilities and photo points for tourists	C1	4.00	4.50	Priority Maintained
16. Vulnerability and disaster management on Cemara Besar Island	D1	3.25	3.75	Priority Maintained
Threat				
1. Availability of tourism objects supporting coral reef tourism on Cemara Besar Island	E1	3.00	3.75	Development Priority
2. The existence of other superior tourist objects besides coral reef tourism	F1	3.00	3.75	Development Priority
3. Availability of health facilities	G1	2.25	3.50	Development Priority
4. Availability of public facilities (toilet and gazebo)	H1	3.00	4.25	Development Priority
5. Availability of lodging facilities	I1	2.50	4.75	Development Priority
6. Condition of clean water infrastructure	J1	3.00	3.50	Development Priority
7. Port Availability	K1	2.25	3.75	Development Priority
8. Government support (financial and policy)	L1	3.00	4.25	Development Priority
9. Availability of new job opportunities	M1	2.25	4.50	Development Priority

Table 6. IFE matrix

Internal Strategy Factors	Weight	Benefit Rate Value	Score
Strength			
1. Density of coral reefs on Cemara Besar Island	0.074	4.25	0.315
2. Diversity of Coral Reefs	0.069	4.75	0.326
3. Diversity of Aquatic Biota	0.063	3.75	0.237
4. Quality of human resources in handling domestic tourists	0.063	4.25	0.269
5. Quality of human resources for education and conservation tourism	0.085	4.5	0.383
6. Area Cleanliness	0.058	3.75	0.216
7. Accessibility to coral tourism areas	0.060	2.25	0.136
8. Reef tourism facilities	0.071	4.75	0.339
Total	**0.544**		**2.222**
Weakness			
1. Presence of Dangerous Biota	0.044	4.5	0.198
2. Condition of coral reefs on Cemara Besar Island	0.104	4.75	0.496
3. Coral Reef Tourism	0.088	4.25	0.374
4. The Presence of Typical Animals	0.044	4	0.176
5. Existence of Area Management	0.104	4	0.418
6. The quality of human resources in handling foreign tourists	0.071	4	0.286
Total	0.456		
Total			**1.946**

Table 7. EFE matrix

External Strategy Factors	Weight	Benefit Rate Value	Score
Opportunities			
1. Potential for domestic tourists	0.048	4.5	0.214
2. The potential of foreign tourists	0.046	4.25	0.195
3. Security of tourist sites (criminality)	0.029	4.5	0.131
4. Availability of Communication Facilities	0.038	4.75	0.178
5. The existence of special souvenirs	0.020	3.5	0.070
6. Community support for coral reef tourism	0.051	4.5	0.229
7. Condition of electricity infrastructure	0.038	3.5	0.134
8. Cemara Besar Island tourism promotion	0.039	4	0.157
9. The existence of law enforcement or sanctions against environmental destroyers	0.046	4	0.183
10. Worthy means of transportation	0.035	4.25	0.149
11. Adequate means of transportation	0.031	4.25	0.131
12. Condition of infrastructure leading to tourist areas (waves, etc.)	0.032	3.5	0.111
13. Logistics supply (foodstuffs, etc.)	0.034	3.5	0.120
14. Existence of interesting culinary tourism	0.025	4.25	0.106
15. Availability of facilities and photo points for tourists	0.041	4.5	0.184
16. Vulnerability and disaster management on Cemara Besar Island	0.047	3.75	0.175
Total	0.598		**2.466**
Threat			
1. Availability of tourism objects supporting coral reef tourism on Cemara Besar Island	0.043	3.75	0.163
2. The existence of other superior tourist objects besides coral reef tourism	0.043	3.75	0.159
3. Availability of health facilities	0.047	3.5	0.163
4. Availability of public facilities (toilet and gazebo)	0.047	4.25	0.198
5. Availability of lodging facilities	0.034	4.75	0.162
6. Condition of clean water infrastructure	0.045	3.5	0.158
7. Port Availability	0.047	3.75	0.175
8. Government support (financial and policy)	0.056	4.25	0.237
9. Availability of new job opportunities	0.041	4.5	0.184
Total	0.402		1.599
Total			**4.065**

Table 8. EFE matrix

	Strength	**Weakness**
INTERNAL EXTERNAL	A. Density of coral reefs on Cemara Besar Island B. Diversity of Coral Reefs C. Diversity of Aquatic Biota D. Quality of human resources in handling domestic tourists E. Quality of human resources for education and conservation tourism F. Area Cleanliness G. Accessibility to coral tourism areas H. Reef tourism facilities	I. Presence of Dangerous Biota J. Condition of coral reefs on Cemara Besar Island K. Coral Reef Tourism L. The Presence of Typical Animals M. Existence of Area Management N. The quality of human resources in handling foreign tourists
Opportunities	**SO Strategy**	**WO Strategy**
O. Potential for domestic tourists P. The potential of foreign tourists Q. Security of tourist sites (criminality) R. Availability of Communication Facilities S. The existence of special souvenirs T. Community support for coral reef tourism U. Condition of electricity infrastructure V. Cemara Besar Island tourism promotion W. The existence of law enforcement or sanctions against environmental destroyers X. Worthy means of transportation Y. Adequate means of transportation Z. Condition of infrastructure leading to tourist areas (waves, etc.) A1. Logistics supply (foodstuffs, etc.) B1. Existence of interesting culinary tourism C1. Availability of facilities and photo points for tourists D1. Vulnerability and disaster management on Cemara Besar Island	1. Human Resources Development (counseling and training) (D, E, O, P, T, B1)) 2. Development of Coral Reef Tourism Promotion (A, B, C, O, P, V, B1, C1) 3. Development of tour packages (coral reef and non-coral reef tourism) (A, B, C, F, G, H, O, P, V) 4. Development of tourist facilities (F, G, H, Q, R, U, W, X, Y, Z, C1) 5. Culinary Development (D, H, A1, B1)	1. Mitigation Development (I, N, O, P, D1) 2. Development of the concept of coral garden tourism (J, K, M, O, P, T, V, X, Y) 3. Development of Cemara Besar Island Area Management (J, K, O, P, Q, R, U, V, W, D1) 4. Development of souvenirs and special animals (L, S, O, P, V, A1)
Threat	**ST Strategy**	**WT Strategy**
E1. Availability of tourism objects supporting coral reef tourism on Cemara Besar Island F1. The existence of other superior tourist objects besides coral reef tourism G1. Availability of health facilities H1. Availability of public facilities (toilet and gazebo) I1. Availability of lodging facilities J1. Condition of clean water infrastructure K1. Port Availability L1. Government support (financial and policy) M1. Availability of new job opportunities	1. Development of supporting infrastructure (F, G, H, F1, G1, H1, I1, J1, K1, L1, M1) 2. Development of supporting tourism objects (A, B, C, H, E1, F1, L1, M1))	1. Utilization of Dangerous Biota (I, F1)

The priority of alternative strategies is calculated based on the linkage of alternative strategies to the building factors. The following is the result of calculating the priority of alternative strategies (Table 9):

Furthermore, the determination of alternative management strategies is carried out. Determination of alternative management strategies is calculated based on the coordinates of the x and y axes where the x axis is obtained through the difference in scores of internal factors between strengths and weaknesses, while the y axis is obtained through the difference in scores of external factors between opportunities and threats.

The X (horizontal) axis can be obtained based on:
X = 2.222 – 1.946 = 0.275

Y axis (vertical) can be obtained based on:
Y = 2.466 – 1.599 = 0.867

In the alternative management planning strategy diagram, the coordinate points (0.275; 0.867) can be described as follows in Figure 2.

Table 9. Strategy Alternative Priority

No	SWOT	Linkages	Total Score	Priority
	SO Strategy			
1	Human Resources Development (counseling and training)	D, E, O, P, T, B1	1.395	VIII
2	Development of Coral Reef Tourism Promotion	A, B, C, O, P, V, B1, C1	1.734	VII
3	Development of tour packages (coral reef and non-coral	A, B, C, F, G, H, O, P, V	2.135	III
4	reef tourism)	F, G, H, Q, R, U, W, X, Y, Z, C1	1.893	VI
5	Development of tourist facilities	D, H, A1, B1	0.834	XI
	Culinary Development			
	WO Strategy			
1	Mitigation Development	I, N, O, P, D1	1.067	IX
2	Development of the concept of coral garden tourism	J, K, M, O, P, T, V, X, Y	2.361	I
3	Development of Cemara Besar Island Area Management	J, K, O, P, Q, R, U, V, W, D1	2.237	II
4	Development of souvenirs and special animals	L, S, O, P, V, A1	0.931	X
	ST Strategy			
1	Development of supporting infrastructure	F, G, H, F1, G1, H1, I1, J1, K1, L1, M1	2.128	IV
2	Development of supporting tourism objects	A, B, C, H, E1, F1, L1, M1	1.961	V
	WT Strategy			
1	Utilization of Dangerous Biota	I, F1	0.357	XII

Figure 2. Management Planning Strategy Alternative Diagram.

From the diagram above (Figure 2), it can be concluded that from the results of the difference between the scoring of internal and external factors, shown in quadrant 1, the situation faced by the manager is very good because it has internal strengths that are able to take advantage of good opportunities. The diagram shows that the management strategy that must be implemented is an aggressive strategy by supporting an aggressive growth policy and implementing an alternative SO (strength – opportunity) strategy.

CONCLUSION

The conclusions that can be drawn from this study are from the calculation of the carrying capacity of the marine utilization zone in Cemara Besar Island, Karimunjawa National Park, the maximum number of snorkeling tourists is 1483 people/day and the maximum number of diving tourists is 989 people/day, then with the correction factor become 58 people/day and 39 people/day, respectively, and with the consideration of the management are 25 people/day and 17 people/day, respectively. In the marine protected zone, the maximum number of snorkeling tourists is 402 people/day and the maximum diving tourists is 268 people/day, then with the correction factor are 18 people/day and 12 people/day, respectively, and with management considerations are 9 people/day and 6 people/day, respectively.

There are 12 alternative strategies obtained from the SWOT analysis,

a. The SO strategy has 5 strategies, namely the development of human resources, the development of coral reef tourism promotion, the development of tour packages (coral reef and non-coral reef tourism), the development of tourism facilities and facilities, and culinary development.
b. The WO strategy has 3 alternative strategies, namely the development of mitigation, the development of the concept of coral garden tourism, and the development of management of the big pine island.
c. The ST strategy has 2 alternative strategies, namely the development of supporting infrastructure and the development of supporting tourism objects.
d. The WT strategy has 2 alternative strategies, namely the use of dangerous biota, and the development of souvenirs and unique animals.

There are 2 points that are recommended as the application of the concept of ecoedutourism based on coral gardens, namely point B (-5.80314, 110.38081) and point D (-5.80106, 110.38201) because in these two areas the condition of coral reefs is not too good and requires restoration. Furthermore, from the observations, it can also be concluded that point A, point C, and point E are not recommended for coral garden activities but can be carried out if needed because the conditions are still quite good even though the coral reefs are starting to experience bleaching, but these points can still be recommended for snorkeling and diving activities.

ACKOWLEDGEMENTS

Thanks to the Marine Research Center, The Agency for Research and Human Resources Development, Ministry of Marine Affairs and Fisheries which has provided opportunities and facilities for the authors to carry out this study and credits for all members of the survey team during the mission to Karimunjawa Islands. The paper contributes to local government, local people, and stakeholders who have the authority in planning and managing the Karimunjawa Islands. All the authors are main contributors.

REFFERENCE

Arida. I.N.S. (2017, in Indonesian). *Development, Local Participation, and Ecotourism Challenges*. Denpasar: Cakra Press.

Badan Pusat Statistik. (2017, in Indonesia). Jepara Regency in Figures.

Badan Pusat Statistik. (2020, in Indonesia). Karimunjawa District in Figures.

Balai Taman Nasional Karimunjawa. (2004, in Indonesian). Zoning Arrangement of Karimunjawa National Park, Jepara Regency, Central Java Province. BTNKJ. Semarang. Indonesia.

Basuki, S. (2005). *SWOT Analysis in the Marketing Strategy of Student's Cooperative (KOPMA) Jogjakarta State University (UNY)*. Skripsi: Yogyakarta. Program Intenasional Universitas Islam Indonesia. (Tidak Dipublikasikan).

Epstein, N., Bak, R.P.M., & Rinkevich, B. (2001). Strategies for gardening denuded coral reef areas: the applicability of using different types of coral material for reef restoration. *Restoration Ecology, 9*(4), 432-442.

Gustiantini. L., & Ilahude. D. (2012). Foraminifera Bentik dalam Sedimen Sebagai Indikator Kondisi Lingkungan Terumbu Karang di Perairan Pulau Cemara Besar dan Cemara Kecil Kepulauan Karimunjawa Jawa Tengah. *Jurnal Geologi Kelautan, 10*(1), 35. DOI:10.32693/jgk.10.1.2012.213

Herlambang, M.F.R., Wicaksono, A.D., & Hidayat, A.R. T. (2016, in Indonesian). The Capability of the Carrying Capacity of the Tourism Environment of

Tirta Nirwana Songgoriti. *Jurnal Tata Kota Dan Daerah, 8*(2), 57– 62.

Kresnapati. P., Setyawan. D.A., & Kusumawardhana, B. (2017, in Indonesian). Sports Activities in Coastal Communities in North Semarang District in Semarang City. Universitas PGRI Semarang Upgris Press. PP. 1- 14.

Kemenpar. (2016, in Indonesian). Development of Priority Tourism Destinations 2016-2019. Disampaikan pada Rapat Koordinasi Nasional Kementerian Pariwisata "Äkselerasi Pembangunan Kepariwisataan Dalam Rangka Pencapaian Target 12 Juta Wisman dan 260 Juta Wisnus 2016". Jakarta.

Kumaat, J.Ch., Lasut, M.T., & Wantasen, A. (2017, in Indonesian). Geographic Information System Application in Determining Beach Tourism Areas in Bitung City. *Jurnal Ilmiah Platax, 5*(1), 10-20.

Lintong. O., Oroh, D.R.S., Tulung, E.C.M. (2019, in Indonesian). Oceanographic Ecological Study of Manado Bay to Determine the Structure of Artificial Coral Garden and Mangrove Areas as New Tourism Destinations. *Jurnal Pesisir dan Laut Tropis, 7*(3), 286.

Luthfi. O.M. (2016). Coral Reef Conservation on Sempu Island Using the Coral Garden Concept. Journal of Innovation and Applied Technology, 2(1), 210-216.

Montoya-Maya, Phanor & Reveret, Claude & Frias-Torres, Sarah & Henri, Kerstin & Shah, Nirmal. 2016. Coral gardening as a MPA management tool: a success story in the Republic of Seychelles. 10.13140/RG.2.1.1537.1767.

Muhidin., Pardede, S., Ichsan G., Varrenco, J.A., Prasari, H.R., Jamaludin. (2019). Laporan Teknis: Monitoring Ekosistem Terumbu Karang Taman Nasional Karimunjawa 2019. Wildlife Conservation Society. Bogor. Indonesia.

Nugroho, I. (2011, in Indonesian). Ecotourism and Sustainable Development. Pustaka Pelajar. Yogyakarta. 362 hlm

Pasak. H.A., Manapa, E.S., & Ukkas, M. (2017in Indonesian). Marine Ecotourism Development Study on Pasir Putih Island, Polewali Mandar Regency. *Jurnal Administrasi dan Kebijakan Kesehatan Indonesia, 3*(1), 29-34. DOI: 10.20956/jiks.v3i1.2119

Prastowo, A. (2010, in Indonesian). Mastering Qualitative Research Data Collection Techniques. Jogjakarta: DIVA press.

Pusriskel. (2020, in Indonesian). 2020 Final Report: Recommendations for the Development of a Marine Eco-tourism Area on Cemara Besar Island, Karimunjawa. Badan Riset dan SDM Kelautan dan Perikanan. Jakarta. Indonesia.

Putridhanti, N. (2013, in Indonesian). *Strategy for Managing Potential Coastal Resources for the Development of Marine Ecotourism on Pramuka Island, Thousand Islands, DKI Jakarta*. Undergraduate Thesis, Universitas Brawijaya.

Rahmawati, S., Supriyadi, LH., Azkab, H.M., & Kiswaran, W. (2014, in Indonesian). Seagrass Bed Monitoring Guide.Pusat Penelitian Oseanografi Lembaga Ilmu Pengetahuan Indonesia.Jakarta.

Rauf. K.P., Supriharyono., & Purnomo. P.W. (2015, in Indonesian). Abundance of Zooxanthellae in Acropora Sp. Based on the Depth of the Waters and Different Shades on Pari Island, the Thousand Islands, Jakarta. *Diponegoro Journal of Maquares. 4*(1), 46-54.

Sasmita. E., Darsiharjo., Rahmafitria. F. 2014. Analisis Daya Dukung Wisata Sebagai Upaya Mendukung Fungsi Konservasi Dan Wisata Di Kebun Raya Cibodas Kabupaten Cianjur. Jurnal Manajemen Resort & Leisure. Vol 11 (2).

Setiawan, H., & Hutagaol, R.S. (2017, in Indonesian). Ecoedutourism as an Environmental Education Innovation in Schools: A Case Study in the Bukit Kelam Natural Tourism Park, Sintang District. *Edumedia, 1*(1), 15-21. DOI: https://doi.org/10.51826/edumedia.v1i1.50

Simanjuntak, S.W., Suryanto, A., & Wijayanto. D. (2015, in Indonesian). Mangrove Tourism Development Strategy on Kemujan Island, Karimunjawa. *Jurnal Management of Aquatic Resources, 4*(1), 25-34.

Sulisyati. R., Prihatiningsih. P., & Mulyadi. (2018, in Indonesian). Revision of the Karimunjawa National Park Zoning as an Effort to Compromise Natural Resource Management. *Seminar Nasional Geomatika, 3*, 713. DOI:10.24895/SNG.2018.3-0.1030

Tito, C.K., Jusach, A.J., Hidayat, J.J.,, Indriyawan, M.W., & Zaky, A.R. (2013, in Indonesian). Study of SST, Precipitation, and Salinity in Relation to Porites Coral Growth Rates in Nusa Penida, Bali. *Conference: Seminar Nasional Perikanan dan Kelautan V, Universitas BrawijayaAt: Malang, 5*,

499 – 503.

Torres, S.F. (2015). Large Scale Coral Gardening: A Sustainable Production Method for Coral Reef Restoration. ASLO Aquatic Sciences Meeting.

Wandansari, N.D. (2013). Accounting Treatment of Article 21 Income Tax at Pt. Artha Prima Finance Kotamobagu. *Jurnal Emba, 1*(3), 558-566. DOI: https://doi.org/10.35794/emba.1.3.2013.1861

World Tourism Organization (WTO). (2000). International Tourism A Global Perspective, Madrid, Spain.

Yulianda, F. (2019, in Indonesian). *Aquatic Ecotourism A Concept of Suitability and Carrying Capacity of Marine Tourism and Freshwater Tourism*. IPB Press. Bogor. 89 hlm

Yusuf, M. (2013, in Indonesian). Condition of Coral Reefs and Fish Potential in the Waters of Karimunjawa National Park, Jepara Regency. *Buletin Oseanografi Marina, 2*(2), 54-60.