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ANALYSIS OF THE SUITABILITY OF TURTLE CONSERVATION IN THE ECOTOURISM AREA OF THOUSAND ISLANDS NATIONAL PARK KELAPA DUA ISLAND

Analisis Kesesuaian Konservasi Penyu di Kawasan Ekowisata Taman Nasional Kepulauan Seribu Pulau Kelapa Dua

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ABSTRACT

The high pressure on turtle populations due to habitat degradation, exploitation, and low public awareness makes turtle conservation an important issue in coastal area management. Kelapa Dua Island in the Thousand Islands National Park is one of the turtle conservation areas that also has the potential to be developed as a sustainable ecotourism destination. This study aims to analyze the suitability of beach tourism and formulate a sustainability strategy for ecotourism based on turtle conservation. The method used is a survey with quantitative descriptive approaches. Data collection was carried out through field observations, interviews, questionnaires, and measurement of environmental parameters, which were analyzed using the SWOT Matrix and the Grand Strategy Matrix. The results showed that tourist land was classified as "suitable" with an average score of 68%. The conservation strategy shows high effectiveness with a success rate of 71.98% of turtle egg hatching in the last six years. The results of the analysis showed that the community and conservation officers were in Quadrant I (S–O strategy), while tourists were in Quadrant III (W–T strategy). Therefore, ecotourism management strategies need to be focused on optimizing regional strengths and opportunities as well as strengthening community institutions in facing conservation challenges.

Keywords: Marine Ecotourism, Turtle Conservation, Turtle, Kelapa Dua Island, SWOT

ABSTRAK

Tingginya tekanan terhadap populasi penyu akibat degradasi habitat, eksploitasi, serta rendahnya kesadaran masyarakat menjadikan konservasi penyu sebagai isu penting dalam pengelolaan kawasan pesisir. Pulau Kelapa Dua di Taman Nasional Kepulauan Seribu merupakan salah satu kawasan konservasi penyu yang juga memiliki potensi untuk dikembangkan sebagai destinasi ekowisata berkelanjutan. Penelitian ini bertujuan untuk menganalisis kesesuaian wisata pantai dan merumuskan strategi keberlanjutan ekowisata berbasis konservasi penyu. Metode yang digunakan adalah survei dengan pendekatan

deskriptif kuantitatif. Pengumpulan data dilakukan melalui observasi lapangan, wawancara, kuisioner, dan pengukuran parameter lingkungan, yang dianalisis menggunakan Matriks SWOT dan Grand Strategy Matrix. Hasil menunjukkan bahwa lahan wisata tergolong "sesuai" dengan rata-rata skor 68%. Strategi konservasi menunjukkan efektivitas tinggi dengan tingkat keberhasilan penetasan telur penyu sebesar 71,98% dalam enam tahun terakhir. Hasil analisis menunjukkan bahwa masyarakat dan petugas konservasi berada di Kuadran I (strategi S–O), sementara wisatawan berada di Kuadran III (strategi W–T). Oleh karena itu, strategi pengelolaan ekowisata perlu difokuskan pada optimalisasi kekuatan dan peluang kawasan serta penguatan kelembagaan masyarakat dalam menghadapi tantangan konservasi.

Kata Kunci: Ekowisata Bahari, Konservasi Penyu, Penyu, Pulau Kelapa Dua, SWOT

INTRODUCTION

The Thousand Islands National Park (TNKpS) is a nature conservation area in Indonesia located north of Jakarta, administratively within the North Thousand Islands sub-district, Thousand Islands Regency, Jakarta Province. One of Indonesia's biodiversity conservation areas, Kelapa Dua Island, Thousand Islands, Jakarta Province, is home to a Turtle Conservation Area, part of the National Park Management Section (SPTN) Region I. The turtle species conserved in SPTN Region I are the hawksbill turtle (E. imbricata) and the green turtle (C. mydas) (Nurfajriyah *et al.,,* 2023).

Sea turtles currently face significant threats to their survival. Climate change, habitat destruction, and destructive human activities have put turtle populations worldwide at risk. Turtles are a vital component of Indonesia's marine biodiversity. They require a long time to reproduce, leading to an imbalance between their growth rate and their extinction rate (Nasiti & Sunarto, 2017). All turtle species are listed in Appendix I of CITES (Convention on International Trade in Endangered Species), which prohibits international trade in these species. Various conservation activities are carried out. Conservation areas are established, monitored, and protected for nesting, with the aim of sustainably increasing turtle populations (Godley *et al.,,* 2020).

The primary activity in the Kelapa Dua Island turtle conservation area is to protect and preserve turtles and other marine ecosystems. These activities have proven to be a tourist attraction, attracting tourists to visit and explore the area's attractions and attractions. With the support for ecotourism development, Kelapa Dua Island can further develop a variety of ecotourism activities, such as exploring the beauty of the underwater world. Coastal communities not only play a role in protecting turtle habitat but also in understanding and implementing ecotourism concepts (Ekayani *et al.,,* 2014).

This study aims to analyze the suitability of coastal areas for tourism and turtle nesting habitat, while also assessing the water quality of conservation ponds in Kelapa Dua Island National Park. Finally, a strategy formulation using a SWOT analysis is concluded.

RESEARCH METHODS

Place and Time

This research was conducted on Kelapa Dua Island, North Seribu Island sub-district, Seribu Islands Regency, Jakarta Province, from October 2024 to November 2024.

Tools and Materials

The instruments used in this study were stationery, a mobile phone, a refractometer, a pH meter, a thermometer, a roll meter, and a laptop. The materials used in this study were questionnaires.

Research design

This study used a survey technique to provide a detailed overview for data collection on each required parameter. The key informants included 10 conservation officers, 110 tourists, and 35 local residents.

Data Analysis

The data analysis method used will be quantitative descriptive analysis. The data is then processed and analyzed to provide an overview of the existing problem. In descriptive analysis, data is generally presented in the form of tables, graphs, bar charts, line charts, pie charts, measures of central tendency, measures of data dispersion, and other visualizations.

RESULT

General Conditions of Kelapa Dua Island

Kelapa Dua Island National Park is part of the Thousand Islands National Park, located in the administrative area of the Thousand Islands Administrative Regency, DKI Jakarta Province. This island has an area of approximately 0.67 hectares and is known as one of the important conservation areas in Indonesia, especially in the preservation of turtle populations and tropical coastal vegetation. Kelapa Dua Island, geographically located at 050 39' 14" South Latitude and 1060 34' 08" East Longitude, is bordered by the sea to the north and south, Harapan Island Village to the east and Panggang Island Village to the south.

1. Turtle Conservation Activities in Kelapa Dua Island National Park

Turtle care at conservation centers aims to ensure the health and welfare of turtles under care, especially hatchlings and individuals who have suffered injuries.

2. Water Quality Parameters of Conservation House

The results of water quality measurements in 5 conservation ponds and 1 habituation pond indicate that almost all parameters meet the ideal limits, with the average water quality parameter measurements presented in Table 1.

Table 1. Results of Conservation House Parameter Measurements

Parameter		Conservation Pond					Habituation
		1	2	3	4	5	
pH	k	7,32 – 7,74	7,47 – 7,6	7,22 – 7,71	7,42 – 7,65	7,46 – 7,68	7,43 – 7,74
	r	7,52	7,53	7,52	7,50	7,55	7,56
Temperature	k	29,5 - 31,5	29,9 – 32	29,5 – 32,5	29,9 – 32,1	29,9 – 32,1	31,5 – 33
	r	30,5	30,94	30,9	31	30,94	32,48
Salinity	k	34 – 36	33 – 37	35	34 – 36	34 – 36	32 – 35
	r	34	35	35	35	35	33

Description: k: Range, r: Average

a. pH

Based on the results of water quality measurements carried out in six conservation ponds (including habituation ponds) on Kelapa Dua Island, the following pH results were obtained, as shown in the figure below.

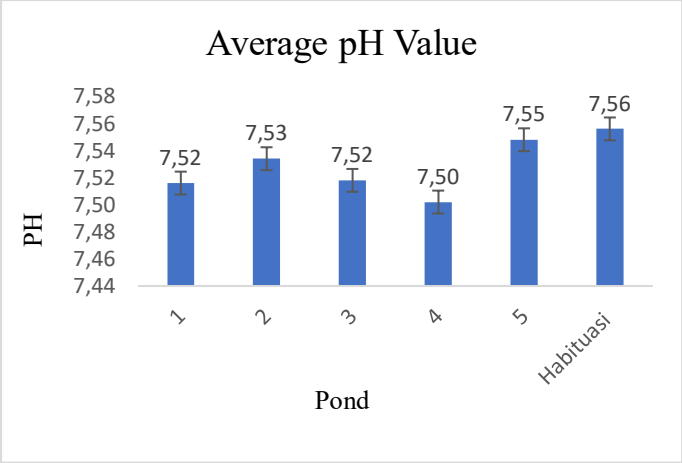

Figure 1. Average pH results

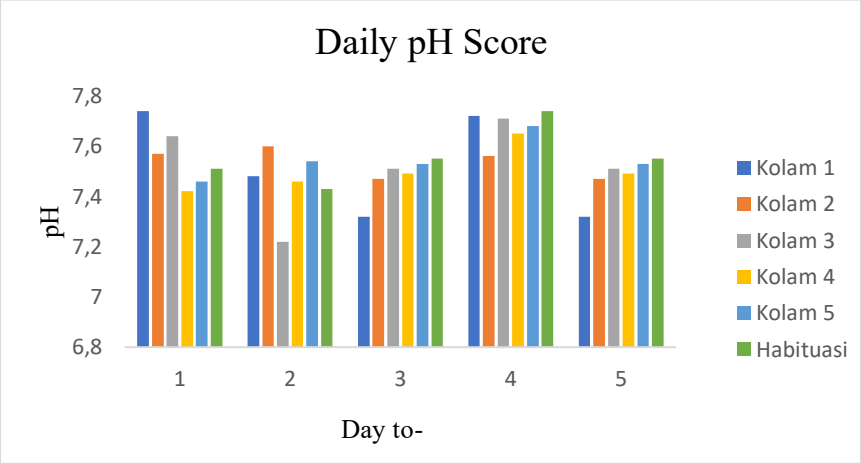

Figure 2. Daily pH Measurement Results

b. Temperature

Water temperature is one of the environmental factors that significantly influences the success of turtle conservation, particularly in hatchling incubation, metabolism, and turtle activity and health levels. After measurements, the average and daily values for each pond are presented in the figure below.

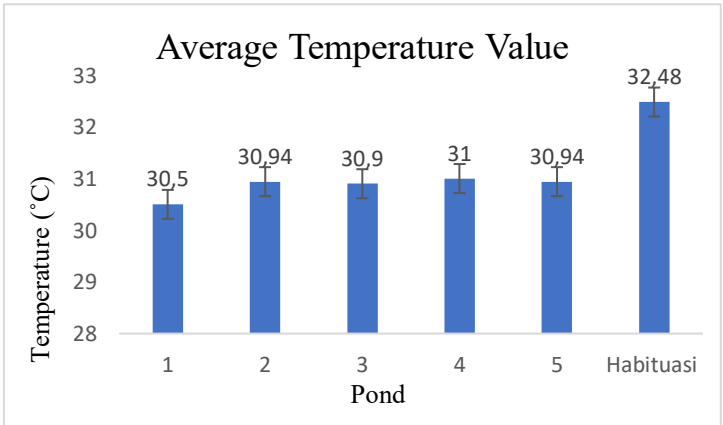

Figure 3. Average Temperature Result

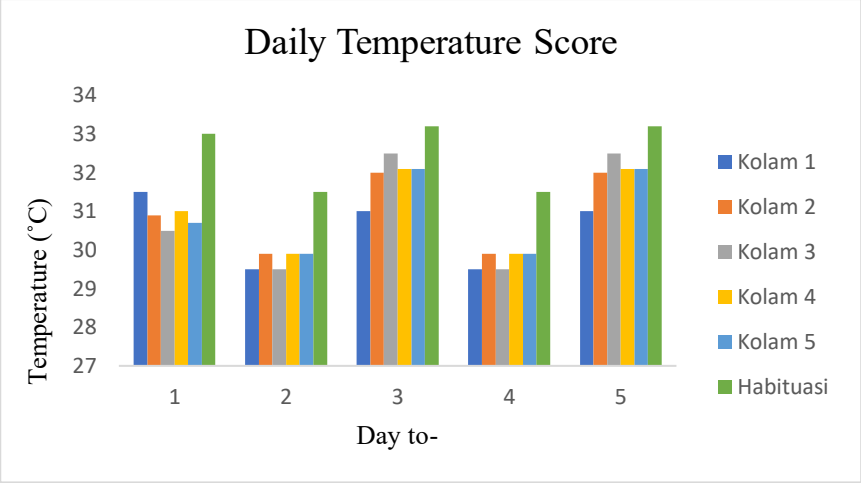

Figure 4. Daily Temperature Measurement Results

c. Salinity

The results of salinity measurements in the Kelapa Dua Island conservation pond during the research period showed varying values, as shown in the figure below.

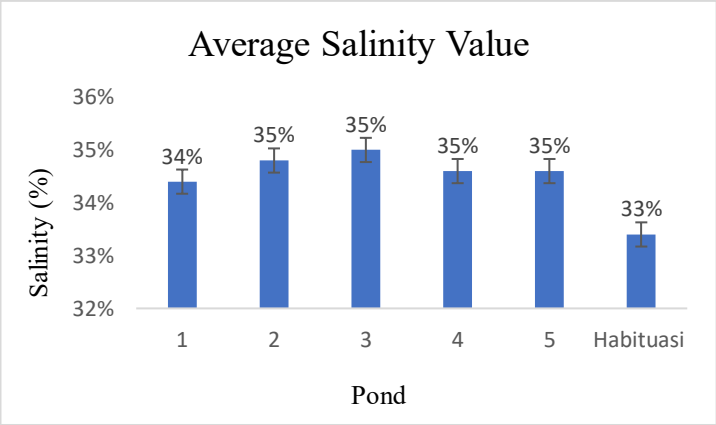

Figure 5. Average Salinity Measurement Results

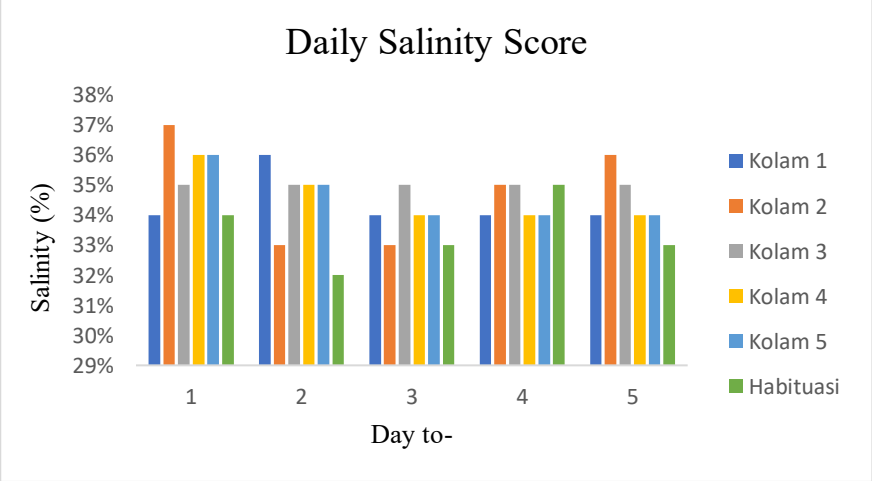

Figure 6. Daily Salinity Measurement Results

3. The Relationship Between Water Quality and Turtle Conservation

Water quality in turtle conservation areas is a key factor in the success of turtle conservation programs, particularly during the incubation and rearing stages of hatchlings. Water quality parameters such as pH, temperature, and salinity significantly influence hatchling survival rates and physiological development.

Respondent Characteristics

1. Age and Gender

The ages of respondents in this study ranged from adolescents to adults, all involved in turtle conservation. Age and gender data are presented in Table 2.

Table 2. Age and Gender Data of Respondents

Respondent Group	Man (People)	Women (People)
Community	18	17
Tourists	43	67
Officers	7	3

Respondent Group	Usia 20 – 35	Usia 36 – 50	Usia > 50
Community	14	16	5
Tourists	66	38	6
Officers	3	5	2

2. Level of education

Education plays a crucial role in fostering public awareness of environmental conservation efforts. In this study, respondents' education levels were categorized as primary, secondary, and tertiary, and are presented in Table 3.

Table 3. Education Level Data

Respondent Group	Basic Education	Secondary Education	Higher Education
Community	16	17	2
Tourists	9	48	53
Officers	0	2	8

3. Work and Sources of Livelihood

The majority of respondents in this study earned their living in the marine and fisheries sector, such as fishermen, conservation workers, and marine tourism operators. Table 4 presents employment data for both local residents and conservation officers.

Table 4. Employment and Livelihood Data

Respondent Group	Fisherman	Conservation Worker	Tourist	Other
Local Community	18	4	11	2
Officer	1	8	1	0

4. Involvement in Conservation

Community and stakeholder participation in conservation activities is crucial for the sustainability of turtle conservation efforts, as presented in Table 5.

Table 5. Conservation Involvement Data

Respondent Group	Actively Involved in Conservation	Get Involved in Ecotourism	Not Involved
Local Community	12	18	5
Officer	8	2	0

Coastal Land Suitability Analysis

Observations of coastal land suitability values were conducted in the eastern part of Kelapa Dua Island. The measurement locations are the primary tourist activity areas during ecotourism visits. The following are the suitability value measurements for the coastal tourism category, which can be seen in Table 6.

Table 6. Coastal Land Suitability Value Matrix

No	Parameter	Result	Weight	Score	Weight x Score
1.	Beach Type	White Sand Mixed with Coral Reef	5	2	10
2.	Beach Width	4.56 m	5	1	5
3.	Coastal Land Cover	Open Land	5	3	15
4.	Dangerous Biota	None	3	3	9
5.	Water Bottom Material	Sandy Coral	3	2	6
6.	Freshwater Availability	None	1	0	0
		Total			**45**

SWOT Strategy Analysis

1. Calculation of Internal and External Strategy Factors

Table 7. Local Community IFAS and EFAS Matrix

No	Strategic Factors	Weight	Rating	Score
	IFAS Matrix			
A. Strength				
S1	Community involvement in conservation activities	0,09	4,03	0,36
S2	The existence of local cultural values that support turtle conservation	0,1	4,46	0,45
S3	Community enthusiasm for environmental education activities	0,1	4,46	0,45
S4	The potential of communities to become conservation partners	0,11	4,63	0,51
S5	Social support between communities for conservation activities	0,1	4,46	0,45
Sub Total Strength		**0,5**		**2,22**
B. Weakness				
W1	Limited public knowledge about conservation	0,1	4,29	0,43
W2	Dependence on environmentally unfriendly	0,1	4,46	0,45

	economic activities			
W3	Lack of conservation training and education for the community	0,1	4,43	0,44
W4	Lack of active participation of some community groups	0,1	4,31	0,43
W5	Low access to conservation information among the public	0,1	4,23	0,42
Sub Total Weaknesses		**0,5**		**2,17**
Total IFE		**1**		
	EFAS Matrix			
A. Opportunity				
O1	Providing opportunities for local communities to develop MSMEs	0,1	4,46	0,45
O2	Global trends in sea turtle population conservation	0,1	4,31	0,43
O3	Providing an understanding of the importance of turtle conservation	0,11	4,74	0,52
O4	The impact of turtle conservation activities on Kelapa Dua Island	0,1	4,34	0,43
O5	The existence of Non-Tax State Revenue (PNBP)	0,1	4,51	0,45
Sub Total Opportunities		**0,51**		**2,28**
B. Threat				
T1	Tourist awareness not to disturb turtles	0,1	4,54	0,45
T2	Climate change impacts on turtle habituation	0,1	4,49	0,45
T3	Protection of turtles from exploitation and poaching	0,1	4,57	0,46
T4	Government assistance is still not sufficient to meet conservation needs	0,09	4,03	0,36
T5	Uncertainty of government policy	0,1	4,4	0,44
Sub Total Threats		**0,49**		**2,16**
Total EFAS		**1**		

Table 8. IFAS and EFAS Tourist Matrix

No	Strategic Factors	Weight	Rating	Score
	IFE Matrix			
A. Strength				
S1	Conservation programs that provide environmental education	0,11	4,77	0,52
S2	Turtles as a tourist attraction	0,09	4,31	0,39
S3	Community involvement in ecotourism activities	0,09	4,15	0,37
S4	The importance of other tourism offered in the national park	0,11	4,51	0,50
S5	There is interactive education with officers	0,09	4,37	0,40
Sub Total Strength		**0,49**		**2,18**
B. Weakness				

W1	Lack of promotion outside the island	0,1	4,45	0,45
W1	Inadequate facilities and infrastructure	0,11	4,63	0,51
W3	Limited fresh water availability	0,1	4,42	0,44
W4	No guides and information boards	0,1	4,46	0,45
W5	Inadequate location accessibility	0,1	4,50	0,45
Sub Total Weaknesses		**0,51**		**2,3**
Total IFE		**1**		
	EFE Matrix			
A. Opportunity				
O1	The location around the conservation area is a potential tourist attraction.	0,1	4,42	0,44
O2	Global trends in turtle population conservation	0,1	4,44	0,44
O3	Conservation education and promotion through social media	0,1	4,45	0,45
O4	Partnerships with non-governmental organizations	0,1	4,49	0,45
O5	The existence of Non-Tax State Revenue (PNBP)	0,1	4,52	0,45
Sub Total Opportunities		**0,5**		**2,23**
B. Threat				
T1	Tourist awareness in protecting turtle habitats is still low	0,1	4,48	0,45
T2	Climate change affecting turtle habituation	0,1	4,50	0,45
T3	The threat of exploitation and poaching of turtles	0,1	4,53	0,45
T4	Government assistance that does not meet conservation needs	0,1	4,50	0,45
T5	Uncertainty of government policy	0,1	4,57	0,46
Sub Total Threats		**0,5**		**2,26**
Total EFE		**1**		

Table 9. IFAS and EFAS Matrix of Conservation Officers

No	**Strategic Factors**	**Weight**	**Rating**	**Score**
	IFE Matrix			
A. Strength				
S1	A conservation program that provides environmental education for tourists.	0,1	4,6	0,46
S2	Turtles as a tourist attraction in Seribu Islands National Park	0,09	4,6	0,43
S3	Community involvement in ecotourism activities	0,1	4,5	0,44
S4	The importance of other tourism offered in the National Park	0,1	4,7	0,47
S5	There is interactive education with officers for tourists	0,1	4,5	0,46
Sub Total Strength		**0,49**		**2,26**
B. Weakness				
W1	Lack of promotion outside the island	0,1	4,2	0,42

W1	Conservation facilities and infrastructure are inadequate	0,1	4,1	0,41
W3	Limited availability of fresh water	0,09	3,8	0,34
W4	There are no guides and turtle education information boards	0,11	4	0,44
W5	Location accessibility for tourists	0,11	3,8	0,42
Sub Total Weaknesses		**0,51**		**2,03**
Total IFE		**1**		
	EFE Matrix			
A. Opportunity				
O1	Conservation locations are located around tourist attractions	0,1	4,6	0,46
O2	Global trends in turtle population conservation	0,09	4,5	0,41
O3	Conservation education and promotion via social media	0,1	4,6	0,46
O4	Partnership with Non-Governmental Organizations	0,1	4,9	0,49
O5	The existence of Non-Tax State Revenue (PNBP)	0,1	4,7	0,47
Sub Total Opportunities		**0,49**		**2,29**
B. Threat				
T1	Low awareness of tourists does not disturb turtles	0,11	3,7	0,41
T2	Impact of climate change on turtle habituation	0,1	3,8	0,38
T3	Threat of exploitation and poaching	0,1	4,4	0,44
T4	Government assistance does not meet conservation needs	0,1	3,8	0,38
T5	Uncertainty of government policy	0,1	4,1	0,41
Sub Total Threats		**0,51**		**2,02**
Total EFE				

2. Grand Strategy Matrix Analysis

After carrying out the calculations, the next step is to determine the coordinates which will be presented in Figure 7.

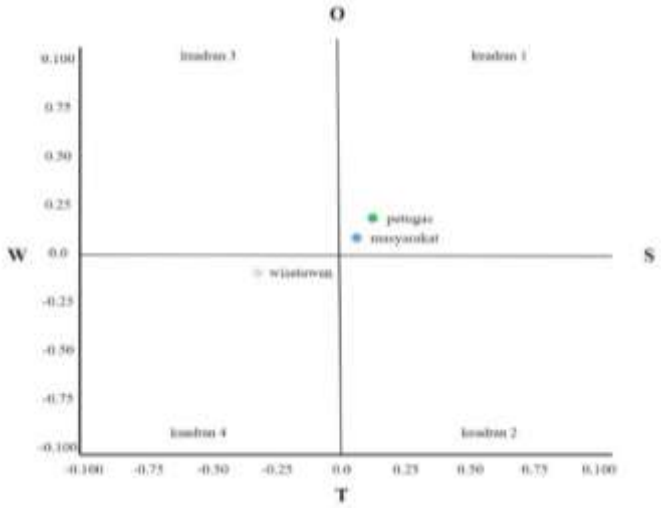

Figure 7. Quadrant Diagram

3. Strategy Formulation

The mapping results show that the community and officers are in Quadrant I (S–O), while tourists are in Quadrant III (W–T). The strategy description of each actor is explained in the discussion.

DISCUSSION

General Conditions of Kelapa Dua Island

Kelapa Dua Island, geographically located at 050 39’ 14” South Latitude and 1060 34’ 08” East Longitude, is bordered by the Sea to the north and south, Harapan Island Village to the east and Panggang Island Village to the south. This island is administratively located in the Kelapa Island sub-district, North Seribu Islands District, Seribu Islands Regency, DKI Jakarta. This island has an area of approximately 0.67 hectares and is known as one of the important conservation areas in Indonesia, especially in the preservation of turtle populations and tropical coastal vegetation. Kelapa Dua Island has a primary function as a conservation area. Public access to this island is strictly limited in order to maintain the sustainability of the existing ecosystem, especially for research activities, biodiversity monitoring, and environmental education. Within this area there are also research facilities managed by the Seribu Islands National Park Office (BTNKS), such as observation towers and monitoring facilities. For infrastructure, there are a total of 3 buildings in the National Park office, 1 serves as an office and 2 of them as women's and men's dormitories. For turtle care, there is one conservation house with five swimming pools and one turtle habituation area located on the beach. This is typically used as the final shelter for turtles before they are released into the wild.

In terms of management, Kelapa Dua Island is under the direct supervision of the Thousand Islands National Park Office and is included in the core zone, meaning no direct community use is permitted. Conservation efforts on the island include monitoring bird populations, rehabilitating coastal vegetation, and monitoring potential threats such as poaching and marine pollution. Due to these conditions, Kelapa Dua Island is a crucial area within Indonesia's coastal ecosystem network and serves as a natural laboratory for biodiversity research and environmental conservation.

Two species of turtle are commonly found in the waters of Kelapa Dua Island: the Hawksbill Turtle and the Green Turtle. The research station is located directly within the Thousand Islands National Park, on Kelapa Dua Island, located on the western side of Kelapa Dua Island, close to local residential areas.

1. Turtle Conservation Activities in Kelapa Dua Island National Park

Some of the main activities in turtle conservation include:

1. Turtle Tank Cleaning: Tank cleaning is carried out periodically to maintain the cleanliness of the turtle's environment and prevent the growth of bacteria and algae that can affect the turtle's health. On Kelapa Dua Island, tank cleaning is carried out routinely to ensure the cleanliness of the hatchling rearing area before they are released into the sea. According to Wyneken *et al.,* (2006), clean water conditions significantly influence the health of hatchlings and can prevent fungal infections and other skin diseases.
2. Feeding: Feeding is done by considering the type of natural food the turtles eat according to their developmental stage. Research conducted by Bjorndal (1997) shows that providing feed with a balanced nutritional composition can increase the growth rate and endurance of hatchlings.
3. Turtle Treatment: Turtles experiencing injuries or illnesses will receive appropriate medical care, such as antibiotics, wound care, and rehabilitation before being released into the wild. On Kelapa Dua Island, turtle rehabilitation is carried out for individuals found in a weak condition or injured by human activity or predator attacks. According to Norton *et al.,* (2018), prompt and appropriate treatment can increase the survival rate of turtles experiencing health problems.

2. Water Quality Parameters of Conservation House

a. pH

According to Tansiah *et al.,* (2017) and Purwanasari (2006), the optimal pH value for turtle habitat in conservation ponds ranges from 7.5 to 8.5. This value reflects neutral to slightly alkaline conditions, which align with the biological tolerance of turtles, both in the hatchling and adult stages.

Figures 1 and 2 show that the pH of the pond water ranges from 7.22 to 7.74, which is generally within acceptable limits for turtle ponds. However, the pH in some ponds decreased after cleaning. For example, in Pond 1, the pH decreased from 7.74 on the first day of testing to 7.32 on days 3 and 5, while in Pond 3, it even dropped to 7.22 on day 2. This decrease in pH can be caused by several factors. First, the pond cleaning process can stir up bottom sediment containing acidic dissolved organic compounds, which then lowers the water pH. Second, the possible accumulation of food waste degraded by microorganisms produces acidic compounds, which also affects pH stability (Effendi, 2003). Third, minimal circulation and aeration can also lead to the accumulation of carbon dioxide (CO_2), which dissolves in the water and forms carbonic acid, making the water more acidic.

In general, the pH value in the Kelapa Dua Island conservation pond is still considered ideal for turtle survival, but regular monitoring is required to maintain the stability of this parameter. Water management efforts such as circulation systems, organic waste filtration, and pond cleaning schedules must be considered to optimally control pH fluctuations.

b. Temperature

According to Mrosovsky (2006) and Hamann *et al.,* (2020), the ideal temperature range for turtle habitats, particularly in breeding or conservation ponds, is between 28°C and 32°C. Temperatures that are too high can accelerate metabolism but also increase thermal stress, while temperatures that are too low will slow physiological processes and can negatively impact turtle growth and the immune system.

Water temperature measurements in the conservation pond on Kelapa Dua Island show a temperature range of 29.5°C and 33.2°C. These values are presented in Figures 3 and 4. The figures show that the pond water temperature at most measurement points is within the ideal range and is quite stable. However, there are several important caveats, particularly in the habituation pond, which recorded the highest temperature of 33.2°C, exceeding the upper ideal limit. According to Santidrián Tomillo *et al.,* (2014), this temperature increase is likely caused by several factors, including:

1. Direct exposure to sunlight without sufficient natural shade such as trees or a roof.
2. Lack of water circulation or aeration, which causes surface water to become warmer due to heat accumulation.
3. The condition of the pool is closed and not deep enough, so the water tends to warm up quickly during the day.

Conversely, a decrease in temperature was also recorded after the pool measurement process, as occurred on days 2 and 4, where the temperature throughout the pool was at 29.5°C – 29.9°C, which is close to the lower limit of the ideal temperature. This decrease could occur due to the introduction of new water during cleaning or evaporation, which reduces the water's heat, especially if it is carried out during times with low solar intensity.

c. Salinity

As quoted in the journal Arisna, A.P. (2020), according to the Decree of the Minister of Environment No. 51 of 2004 concerning good salinity standards for marine biota, the range is 30-34 ppt (%). Within this range, turtles can perform optimal activities and develop without experiencing osmotic imbalance. Salinity values that are too high can cause dehydration and osmotic stress, while values that are too low can disrupt the electrolyte balance in the turtle's body. Salinity measurements in the Kelapa Dua Island conservation pond during the study period showed values varying between 32% and 37%, as presented in Figures 5 and 6.

Salinity values exceeding 35‰ can cause osmotic stress, especially in newly hatched hatchlings still adapting to the environment (Limpus & Chatto, 2004). Therefore, regular monitoring is important to ensure salinity remains within the optimal range. Furthermore, observations indicate that most salinity values are within the ideal range. However, several measurement points, such as Pond 2, reached a salinity of 37% on the first day, followed by Ponds 4 and 5, which also reached 36% on the first day. These results were obtained on the morning of October 12th and indicate values slightly exceeding the ideal upper limit. Salinity exceeding 35% has the potential to disrupt the turtle's body fluid balance, especially if it persists for a prolonged period without adjustment.

The increase in salinity is likely caused by water evaporation due to high temperatures and direct sunlight exposure, without adequate freshwater addition. Another contributing factor could be the closed conditions of the pond, which accelerate the accumulation of dissolved salts. Conversely, the decrease in salinity, as seen in Pond 2 on days 2 and 3 with a salinity of 33% and in the habituation pond on day 2, which also decreased to 32%, could be due to the influx of freshwater during the draining and refilling of the pond. This decrease could also be influenced by undissolved turtle food, which creates an imbalance in the water composition.

3. The Relationship Between Water Quality and Turtle Conservation

The results of this study indicate that water quality parameters at the Kelapa Dua Island conservation house remain within the appropriate range to support turtle conservation programs. This finding supports the conservation success demonstrated by the high turtle egg

hatching rate over the past six years, averaging 71.98%. Therefore, good water quality is a crucial foundation for supporting sustainable turtle conservation (Hamann *et al.,* 2020).

Respondent Characteristics

The characteristics of the respondents in this study are crucial in understanding their background, experiences, and perceptions of sea turtle conservation efforts on Kelapa Dua Island. Data on respondent characteristics were collected through interviews and questionnaires covering demographic and socioeconomic variables. This study involved a total of 155 respondents, comprising various groups: 35 local residents, 110 tourists, and 10 conservation officers. Respondents were selected based on their involvement in tourism activities, management, and conservation supervision at the study site. This demographic data is expected to provide a comprehensive overview of the profile of the respondents who contributed to the study.

Coastal Land Suitability Analysis

The following are the results of measuring the suitability value for the beach tourism category, which can be seen in Table 6.

$$\mathbf{IKW = \Sigma\ [\ Ni/Nmaks]\ x\ 100\% = [45/66]\ x\ 100\% = 68\%}$$

Based on the measurements of the area, the suitability score for the coastal area category was 68%. This result indicates that the suitability of coastal tourism for the ecotourism of Kelapa Dua Island National Park is quite suitable. Kelapa Dua Beach may appear small, and fresh water availability on the island is quite difficult. However, several other factors enhance the beach's value, such as the absence of dangerous biota around the beach and the calm waves due to the presence of breakwaters. Therefore, despite the challenge of clean water availability, Kelapa Dua Beach's other advantages contribute to its fairly suitable coastal tourism rating.

These research findings align with the findings of Rahmadani *et al.,* (2022), which indicate that cleanliness, accessibility, and safety are the main factors influencing tourist satisfaction at marine tourism destinations. This evaluation is expected to provide recommendations for management to improve the quality of tourist destinations on Kelapa Dua Island.

SWOT Strategy Analysis

1. Grand Strategy Matrix Analysis

Based on Figure 7, the calculation results show that the community category has a coordinate score of (0.03; 0.06), tourists are at position (-0.06; -0.02), and officers are at point (0.11; 0.14). These three points are then mapped into the Grand Strategy Matrix, which is divided into four main strategy quadrants, namely:

- The community and conservation officers are in quadrant I with the formulation of S-O strategies.
- Tourists are in quadrant IV with the formulation of W-T strategies.

2. Strategy Formulation

a. Local Community Strategy (Aggressive Strategy – Quadrant I)

- Integrating local cultural values (S2) with turtle conservation trends (O2) as an effort to form a conservatio-based community identity and maintain the continuity of local wisdom in marine wildlife conservation.
- Developing conservation-based community MSMEs (S4 + O1), such as educational

souvenir products, local tourism services, and environmentally friendly culinary, which are able to improve welfare while supporting conservation (Fandeli & Nurdin, 2005).

- Encourage social participation through community support (S5) to educate the wider public (O4, O5), for example through environmental campaigns, citizen training, and other public activities.
- Increasing active community involvement in environmental education (S1 & S3) through synergy with educational institutions and the government (O3).

b. Tourist Strategy (Survival Strategy – Quadrant IV)

- Increasing tourists' understanding of turtle conservation (W1) to face the challenges of environmental degradation (T2) through direct education during visits.
- Changing tourist behavior that is detrimental to habitat (W2) through strict conservation monitoring and regulations (T1), such as prohibitions on touching turtles and no-access zones.
- Adapting tourism facilities so as not to damage the ecosystem (W3) in response to environmental pressures (T3) by developing environmentally friendly tourism designs.
- Shifting the focus of tourism from exploitation to education (W4) to strengthen the position of conservation amidst commercial pressures (T4), through interpretation, signage, and conservation-based tours (Rahmi *et al.,* 2016).

c. Conservation Officer Strategy (Aggressive Strategy – Quadrant I)

- Optimizing the technical competence of officers (S1) by expanding partnership and cooperation networks (O1), including with NGOs, universities, and government agencies.
- Improving the quality of conservation education by officers (S2) in order to support educational tourism trends (O3, O4) with training and development of educational media.
- Utilizing conservation facilities (S3) to boost regional income potential (O5) through conservation-based non-tax state revenue (PNBP).
- Improving institutional capacity (S4) through ongoing training, certification, and participation in national and international conservation forums (O2, O3).

CONCLUSION

Based on the research conducted, it can be concluded that the sea turtle conservation area on Kelapa Dua Island has sufficient potential to be developed as an ecotourism area based on turtle conservation. This is indicated by the coastal land suitability value of 68%, which is included in the S2 (suitable) category. Furthermore, the results of water quality measurements in the sea turtle conservation pond indicate that all parameters are within ideal limits, thus supporting optimal sea turtle conservation processes. Thus, the environmental conditions in this conservation area as a whole have met good criteria, both in terms of land suitability and the quality of the artificial habitat, to support sustainable sea turtle conservation efforts and the development of educational and conservation tourism activities.

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