Land suitability and economic value of ecotourism development in Masjid Lake of Kuantan Singingi District, Indonesia

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Abstract. Masjid Lake is one of the Objects and Attractions of Nature Tourism (ODTWA) in Riau Province, which is located in Koto Kari Village, Central Kuantan Sub-District, Kuantan Singingi District. This area is potential to support the economic in the non-oil and gas sector. However, the ecotourism development in this area is not yet optimal because it is not supported by integrated ecotourism development planning. In order to support integrated ecotourism planning, this research was conducted to determine the suitability and carrying capacity of the environment, conduct economic valuation and formulate sustainable ecotourism management strategies. Data type have been used include secondary and primary data. Secondary data include thematic map, rainfall, number of visitor and current ecotourism management system. Primary data include bio-geophysical aspects of water in the lake and environment surrounding the lake, tourist characteristics and management status. Secondary data compiled from relevant sources and formal institutions, while primary data collected with observation and survey. The land suitability analysis used were weighted linear combination (WLC) method followed by the Douglas method to calculate the carrying capacity of the environment. The economic valuation of ecotourism was assessed by the traveling cost method (TCM). Meanwhile sustainable ecotourism management strategy was prepared based on evaluation of the sustainability of management with multi-criteria analysis (MCA) and SWOT-AHP. Based on the analysis, it can be explained that suitable area (S1+S2+S3) for ecotourism development in Masjid Lake around 21.87 ha or 95.10% of Masjid Lake ecosystem, Meanwhile, 1.1 ha (4.9%) not suitable (N) for ecotourism development. From 21.87 hectares of suitable land, it is known that the physical carrying capacity (PCC) value = 9,574 visitors/ day, real carrying capacity (RCC) = 6,755 visitors / day and effective carrying capacity (ECC) = 3,378 visitors / day. While the actual tourist visit around 54 visitor/day is not exceeded environmental carrying capacity. The willingness to pay (WTP) value of tourists whom visiting to Masjid Lake around IDR 184,701 / visit / year, giving an actual economic value =IDR 3.64 billion / year, it smaller than available potential economic value=IDR 260.95 billion / year. Based on the MCA and SWOT - AHP analysis, it is shows that the sustainability status of ecotourism management in Masjid Lake classified as poor category with sustainability index=40.0%. However, based on the external and internal factors analysis, it shows that the current situation of ecotourism management in Masjid Lake classified in the favourable category because it has more strengths and opportunities than weaknesses and threats. The strategy that must established to improve current ecotourism management in Masjid Lake is a growth-oriented strategy, as follows: (1) Established an integrated sustainable ecotourism management plan (ISEMP) that accommodates all sustainable ecotourism
development aspects; (2) Using the ISEMP as the basis to assess the feasibility a community-based ecotourism management; (3) Improve staff capacity and community participation for continuous ecotourism innovations; (4) Implement a digital-based ecotourism product marketing system according to market trends; and (5) Improving the ecotourism development accountability system and built ecotourism management reputation continuously.

1. Introduction

Ecotourism development is one of the alternative development sectors in Riau Province besides mining and, timber extraction in forestry and plantation sectors. This is a necessity considering the economic growth in Riau Province during the 2011 - 2018 period tended to decreases with a growth rate of around 2.74%/year. The poor growth of economic caused by the negative growth of mining sector. On the other hand, the growth of non-oil and gas sector tends to increases. This shows that so far development in Riau Province still relies on natural resources extraction directly. The dominant natural resources extraction activities include; oil, gold and coal mining [1]. Meanwhile, the aggressiveness of non-oil and gas growth triggered by an increase in the pulp and paper forest, palm oil and rubber plantation sectors has not been accompanied by efforts to improve the environment quality. This condition has caused negative impact on environment made several natural disasters in Riau Province. During 2018 recorded that floods that occurred have resulted in 144,211 victims, damaged 13,729 housing units and 88 public facilities [2].

Kuantan Singingi is one of the districts in Riau Province that is impacting by environmental damage with the main activity of gold mining, conversion of forest land to oil palm and rubber plantations. This environmental damage has caused a natural disaster with the worst impact in Riau Province. It has been recorded 49,820 people were recorded as victims, damaging 7,615 housing units and 6 public facilities during 2018 [2]. On the other side, Kuantan Singingi Regency has several potential natural resources that can be developed as tourism objects to improve the local community's economy and at the same time could to reduce environmental damage. One of the natural tourism objects that have the potential to be developed into an ecotourism object is the Masjid Lake. However, the development has yet been optimal, which is caused by the integrated ecotourism management plan hasn't prepared.

The effort to develop ecotourism in Masjid Lake is one form of environmentally friendly use as long as the principles of sustainable tourism are well implemented. The principles of ecotourism development according to the Indonesian Minister of Home Affairs Regulation No.33 of 2009, include: (1) There is compatibility between types of ecotourism and conservation characteristics; (2) Providing economic benefits for local communities; 3). Contains environmental education; (4) Provide satisfaction and experience to visitors; (5) Involving community participation; and (6) accommodating local wisdoms. Based on the description above, the principle of ecotourism development is to balance the three pillars, namely achieving the sustainability of economic, social and ecological functions.

To ensure the sustainability of ecotourism development in Masjid Lake, it is necessary to study the Ecotourism Management in the Masjid Lake area of Kuantan Singingi Regency. This study can be a comprehensive effort to formulate a sustainable ecotourism management model by analyzing several aspects needed in the preparation of a sustainable ecotourism management plan, which includes: (1) The Land suitability and environmental carrying capacity aspect of ecotourism potential; (2) The economic value; (3) Sustainable ecotourism development strategy in Masjid Lake.

2. Material and method

The research was conducted in Masjid lake which located in geographic coordinate 101° 32’00” - 101° 33’30” E and 0° 33’30” - 0° 32’30” S. The lake is placed in Koto Kari village, Kuantan Tengah sub district, Kuantan Singi District and Riau Province (Figure 1). Data collection was conducted at June - July 2020.
Types and data sources used in the study include the data sources for land suitability analysis, environmental carrying capacity, economic valuation and the status of ecotourism management analysis. The data for land suitability analysis consists: (1) Physical aspects of water in the lake: water depth, current velocity, colours, and water odour; (2) Bio-geophysical aspect surrounding the lake: soil texture, slope, rainfall, land cover, attractiveness; and (3) proximity to roads and proximity to settlements. Tourist characteristics data used for economic valuation of ecotourism include the frequency of tourist visits, travel costs, age, duration of activity, level of income and tourist education. Meanwhile, the data to formulated ecotourism management strategy include criteria and indicators (C&I) for sustainable ecotourism management, weight and rating of each C&I as well as the current sustainability status of ecotourism management.

The data collection of bio-geophysical data is carried out by using primary and secondary data collection methods. Secondary data were obtained through related institutions authorities including thematic map (space regulation, soil, government administration), rainfall, and satellite imagery: DEM SRTM-30 to generate slope and Landsat-8 satellite imagery for landcover map. Primary data collection of bio-geophysical aspects was carried out by field observations including physical condition of the waters, soil sampling, landscape attractiveness and validate the thematic map have been prepared. The data collection on tourist characteristics was carried out by interviewing to tourists who visited Masjid Lake. Likewise, data collection on sustainability status and ecotourism management strategies is carried out by interviewing key stakeholders.

The sampling technique used in the bio-geophysical aspect of primary data collection is systematic sampling with random start. The starting point of the observation is placed randomly, while the next observation point is placed systematically with distance between plots (grid) of 100 x 100 m. The number of samples is calculated based on population characteristics [3]. The sampling technique for observing the characteristics of tourists was carried out using purposive sampling. The number of samples visitors was calculated based on cross sectional sampling [4]. While data collection on the status and management strategy of ecotourism was carried out by using the snowball sampling method [5].

The analysis method of land suitability was carried out using the weighted linear combination (WLC) method using a set of land suitability criteria and indicators (C&I) collected from various sources (Table 1) and supported by the ArcGIS 10.7 software. The determination of land suitability C&I was carried out using the multi-criteria analysis method (MCA) [6]. After the land suitability map expressed, the analysis continued with environmental carrying capacity analysis is carried out using the Douglas
The economic valuation method for ecotourism development was conducted using the traveling cost method (TCM) [8]. In this analysis, the ecotourism demand curve is analysed using multiple linear regression analysis [9]. Meanwhile, the method of formulating ecotourism management strategies begins with an evaluation of the sustainability of ecotourism development using MCA [10] and is continued with a SWOT-AHP analysis [11] and [12]. Factor analysis influenced the status of sustainable management using the generalized boosted regression model (gbm) of R-Statistics software [13].

Table 1. Criteria and indicators (C&I) land suitability for ecotourism development in lake a.

| Criteria                                    | Indicators          | Unit of measurement | Very suitable (S1) | Moderate suitable (S2) | Marginal suitable (S3) | Not Suitable (N) | References |
|---------------------------------------------|---------------------|---------------------|--------------------|------------------------|------------------------|------------------|------------|
| Water physical condition in the lake        | Water depth         | m                   | 0-5                | 5-7                    | 7-10                   | >10              | [14] modified |
|                                            | Wave velocity       | m/s                 | < 0.15             | 0,15-0,30              | 0,30-0,45              | > 0.45           |            |
|                                            | Water colours       | class               | Clear              | Fairly turbid          | Turbid                 | Very turbid/brown |            |
|                                            | Water Odour         | class               | odourless           | Fairly odour           | Odour                  | Very odour       |            |
| Biological condition surrounding the lake   | Soil texture        | class               | Fine loamy         | Coarse loamy          | Sandy loamy           | Sandy            | [15] modified |
|                                            | Slope               | %                   | 0-5%               | 5-25%                  | 25-35%                 | ≥ 35%            | [16]        |
|                                            | Rainfall            | mm/y                | <1,540             | 1,540-1,632            | 1,632-1,729           | ≥1,729           | [17] modified |
|                                            | Landcover           | class               | Primary of secondary forest | Schrub or dryland agriculture | Paddyland or bare land | Settlement | [20] and [21] modified |
|                                            | Natural attractiveness | %                   | ≥ 95.2             | 88.5 - 95.2           | 81.8 - 88.5           | < 81.8          | [22] modified |
|                                            | Accessibility       | from roads          | m                  | < 500                  | 500-750               | 750-1,000       | ≥ 1,000     |
|                                            |                     | from settlement     | m                  | <500                   | 500-1000              | 1,000-5,000     | ≥ 5,000    |

*Sources: Study of literature

3. Results and discussion

3.1. Masjid Lake condition and tourist characteristics

The interpretation of latest Landsat-8 Satellite Imagery and DEM SRTM-30, shown that the landcover in Masjid Lake consist of watershed area (DAS) covering an area of 155.6 ha with an area of a water body or lake covering an area of 5.7 ha (3.6%), agriculture dry land covering an area of 97.4 ha (62.6%), residential area of 46.1 ha (29.6%) and open land area of 6.4 ha (4.1%). (Figure 1 and Table 2).
Table 2. The distribution of landcover area in Masjid Lake watershed a.

| Landcover                        | Area (Ha) | Proportion (%) |
|----------------------------------|-----------|----------------|
| Water body                       | 5.7       | 3.6            |
| Settlement                       | 46.1      | 29.6           |
| Shrub and dryland agriculture    | 97.4      | 62.6           |
| Bare land                        | 6.4       | 4.1            |
| **Total watershed area**         | **155.6** | **100.0%**     |

a Sources: Landsat-8 data analysis (2020).

Based on interviews with Masjid Lake managements, it is known that the average number of tourist visits to Masjid Lake is 54 tourists per day or the equivalent of 19,710 tourists/year. The interviews result with 41 tourist respondents explained that all tourists who come to the Masjid lake was from various place in Kuantan Singigi District, namely from Central Kuantan Sub District and its surroundings area with various income, age and education levels (Table 3). The frequency of tourist visits from Kuantan Tengah Sub District is relatively more frequent to visit the to this destination compared to other districts. Its due the area closer to this lake, which results in lower travel costs compared to tourists from other sub-districts. The level of demand for the tourism market is influenced by various travel costs and the socio-economic character of tourists [8]. Increasing travel costs will reduce tourism demand. The farther the origin of tourists from tourist destination area will increase travel costs which include transportation and accommodation costs [23].

Table 3. Tourist characteristics in Masjid Lake a.

| Tourist Origin  | N b  | F b (tr/y) c | C b (IDR/tr) c | R b (IDR/m) c | LT b (h/tr) c | E b (y) c | A b (y) c |
|-----------------|------|-------------|---------------|--------------|--------------|-----------|-----------|
| Gunung Tidar    | 9    | 22.0        | 5.5           | 52,316       | 3,898,861    | 2.8       | 11.7      | 39.2      |
| Kuantan Tengah  | 18   | 43.9        | 6.2           | 23,639       | 3,371,712    | 3.8       | 12.7      | 40.8      |
| Sentajo Rayo    | 11   | 26.8        | 5.3           | 96,424       | 3,685,384    | 2.7       | 12.0      | 33.0      |
| Singingi        | 1    | 2.4         | 5.3           | 100,086      | 2,900,694    | 2.9       | 9.0       | 16.6      |
| Kuantan Hilir   | 2    | 4.9         | 4.9           | 144,366      | 2,487,197    | 25        | 10.5      | 34.6      |
| **Total or average** | **41** | **100.0**  | **5.4**       | **83,366**   | **3,268,769**| **2.9**   | **11.2**  | **32.8**  |

a Sources: primary data analysis (2020).

b Field note: N=T number of tourist respondent, F= visit frequency, C= travelling cost, R=tourist income, LT= duration of tourist activity, E=tourist education, A=tourist age.

c Unit of measurement note: tr= number of trips, h=hours, y=year, m=month.

Based on sex, majority of tourists who came to Masjid Lake were male (70.7%), while female tourists were 29.3%. Most of the male tourists’ activities are for picnicking (55.2%) and the remaining 44.8% come to Masjid Lake for fishing. While the majority of female tourists (91.7%) come to Masjid Lake for a having a picnic (Table 4).

Table 4. The distribution of tourist in Masjid Lake based on sex and activities a.

| Sex      | Fishing | Picnics | Total |
|----------|---------|---------|-------|
| n b      | %       | n b      | %      | n b      | %       |
| Male     | 13      | 44.8    | 16    | 55.2     | 29      | 70.7    |
| Female   | 1       | 8.3     | 11    | 91.7     | 12      | 29.3    |
| **Total** | **14** | **34.1** | **27** | **65.9** | **41** | **100.0** |

a Sources: Primary data analysis (2020)
b n= Number of tourists
3.2. Land suitability analysis for ecotourism development

3.2.1. Determination of weights and ratings of land suitability C&I. Based on multi-criteria analysis (MCA) and AHP involving key stakeholder, namely the main stakeholders in the management of Masjid Lake which consists of the Local Tourism Office, Local Development Planning Agency of Kuansing District and the Koto Kari Village Apparatus have succeeded in compiling weights / priorities and ratings of criteria and indicators (C&I) suitability of land for ecotourism development in Masjid Lake as shown in Table 5.

Table 5. Weight of C&I land suitability for ecotourism development.

| Criteria (C)                               | Weight of Criteria (w) | Indicator (I)                      | Weight of indicator (v) |
|--------------------------------------------|------------------------|------------------------------------|-------------------------|
| Water physical condition in the lake       | 0,30                   | Water depth                        | 0,08                    |
|                                            |                        | Wave velocity                      | 0,08                    |
|                                            |                        | Water colours                      | 0,08                    |
|                                            |                        | Water Smells                       | 0,08                    |
| Bio-geophysical condition surrounding the lake | 0,30                   | Soil texture                       | 0,08                    |
|                                            |                        | Slope                              | 0,08                    |
|                                            |                        | Rainfall                           | 0,08                    |
|                                            |                        | Landcover                          | 0,08                    |
| Natural attractiveness                     | 0,30                   | Natural attractiveness             | 0,30                    |
| Accessibility                              | 0,10                   | Proximity from roads               | 0,05                    |
|                                            |                        | Proximity from settlement          | 0,05                    |
| Total                                      | 1,00                   |                                    | 1,00                    |

CR 0.000

Sources: Primary data analysis (2020)

Consistency ratio (CR) < 0.1 (10%) states that the key informant's opinion is consistent so that it can be used for further analysis.

Rating or score on all environmental suitability C&I was carried out by dividing each weight from the AHP analysis by the maximum weight (Table 6).

Table 6. Score or rating of land suitability C&I.

| Suitability degree | Weight/priority (w_i) | Score / rating (r_i) |
|--------------------|-----------------------|----------------------|
| R1                 | 0,49                  | 1,000                |
| R2                 | 0,27                  | 0,551                |
| R3                 | 0,15                  | 0,306                |
| RN                 | 0,09                  | 0,184                |

CR 0,011

Sources: Primary data analysis (2020)

Consistency ratio (CR) < 0.1 (10%) states that the key informant's opinion is consistent so that it can be used for further analysis.

After each C&I of suitability have been assessed. Then all weight and rating values of C&I were entered in a geographic information system (GIS) based database. The data is arranged in a 30x30m pixel raster data format. The calculation of the final score of land suitability was calculated using the weighted linear combination, sum product of multiplication results between the weights and ratings of each criterion and land suitability indicator for ecotourism development using Arcgis 10.7 software. The maximum score produced is 1 and the lowest score is 0. The land suitability class was determined by
quantile analysis, which divides the distribution of the total suitability score distribution into 4 equal parts. In this analysis the maximum total score is 1 and the lowest score is 0. So that the determination of the score using the quantile method as described by Prakash (2003) in [16] is shown in Table 7.

| Land suitability class | Score range | Suitability level |
|------------------------|-------------|-------------------|
| S1                     | 0.75-1      | Very suitable     |
| S2                     | 0.5-0.75    | Moderate suitable |
| S3                     | 0.25-0.5    | Marginal suitable |
| N                      | < 0.25      | Not suitable      |

Sources: Secondary data analysis (2020)

3.2.2. Land suitability analysis result. The results of the weighted linear combination (WLC) analysis shown that 95.1% of the existing land area (21.9 ha) is included in the suitable land class for ecotourism development, which consists of 40.8% in the very suitable class (S1), 23.5% of land with medium suitable class (S2) and 30.8% including marginal suitable (S3). Meanwhile, 4.9% classified as not suitable for development into an ecotourism area (Figure 2 and Table 8). The high percentage of suitable land class for tourism development in Masjid Lake is influenced by the physical quality of the waters that support the development of ecotourism that low flow velocity, adequate lake depth and no pollution which maintained the color and odor of the waters naturally. Environmental conditions around the waters of Masjid Lake also support ecotourism activities that soil conditions Inseptisol and Entisol which good soil textures with relatively flat slopes and sufficient rainfall. Land cover which is dominated by shrubs and dry land farming. Likewise, accessibility to the Masjid Lake ecotourism location is relatively close with roads network and settlements making it easier for tourists to access the location and get accommodation. Meanwhile, the thing that decreases the level of land suitability for ecotourism development is that there is a small buffer zone of the Masjid Lake which has been converted into a settlement which can reduce the attractiveness value of ecotourism. The natural landscape factor has a positive influence on the level of tourist visits, where eco-travelers prefer to visit areas that are relatively unspoiled [24].

Figure 2. Land suitability map of ecotourism development in Masjid Lake.
Table 8. The distribution of land suitability class in Masjid Lake

| Land suitability class | Area (ha) | Proportion (%) |
|-----------------------|-----------|----------------|
| N                     | 1.1       | 4.9            |
| S3                    | 7.1       | 30.8           |
| S2                    | 5.4       | 23.5           |
| S1                    | 9.4       | 40.8           |
| **Total**             | **23.0**  | **100.0**      |

*a* Sources: Primary data analysis (2020)

3.3. Environmental carrying capacity

Environmental carrying capacity analysis started by estimation the physical carrying capacity (PCC) value. In this process, the suitable land area value for ecotourism development (A) is the total of land in class S1 + S2 + S3, which is 21.8712 ha or equal 218.712 m². The optimal land area to support picnic tourism (B) is 65 m²/visitor [25]. Based on interviews with tourists, it is known that the average length of tourist activity around 3.2 hours / tourist. The average service time (ST) for Masjid Lake tourism objects based on interviews with the managers around 9 hours/day. So, the value of the rotation factor (RF) = 2.85 visitor/day. Thus, it can be seen that the value of the PCC Masjid Lake is able to accommodate tourist visits around 9,574 visitors/day. Taking into account the correction factor for rainfall erosivity (Cfr), slope (CfS) and soil erodibility (Cfs), it is known that the real carrying capacity (RCC) of Masjid Lake can accommodate about 6.755 visitors/day or 70.6% of the PCC value. The effective carrying capacity (ECC), which is by taking into account the current management factor, the carrying capacity of Masjid Lake is only able to manage 50% of the RCC or is able to serve tourist visits of 3,378 visitors/day (Table 9). Based ECC compared with actual tourist visit explained that current number of visitor come to Masjid Lake is still lower than the available effective carrying capacity. The main factor caused ecotourism management in Masjid Lake yet optimal is due to the lack aspects of ecotourism management include institutions and the inadequate capacity of management staff. Likewise, the level of community participation still low has caused the ecotourism area in Masjid lake was damaged to fires and land conflicts. This situation also supported by lack of financial aspect, especially the manager's motivation to increase investment in the natural tourism facilities and utilities construction to attract tourists. Improved sustainable ecotourism management requires several prerequisites which include community cohesion, equitable benefit sharing, commitment to conservation and management, in a political, social, economic and environmental context [26].

Table 9. Environmental carrying capacity of ecotourism estimation summary

| PCC Estimation | A<sup>b</sup> (m²)<sup>c</sup> | B<sup>b</sup> (m²/visitor)<sup>c</sup> | N<sup>b</sup> (v/d)<sup>c</sup> | T<sup>b</sup> (h/visitor)<sup>c</sup> | ST<sup>b</sup> (h/day)<sup>c</sup> | RF<sup>b</sup> (v/d)<sup>c</sup> | PCC<sup>b</sup> (v/d)<sup>c</sup> |
|----------------|-----------------|----------------|-----------------|----------------|----------------|----------------|----------------|
| 218,712        | 65              | 54             | 3.16            | 9.0            | 2.85           | 9,574          |

| RCC and ECC Estimation | PCC<sup>b</sup> | Correction Factors | RCC<sup>b</sup> | ECC<sup>b</sup> |
|------------------------|----------------|-------------------|----------------|----------------|
|                        | 9,574          | Cfr<sup>b</sup>   | 0.98           | 0.98           |
|                        |                | CfP<sup>b</sup>   | 0.97           | 0.97           |
|                        |                | CfS<sup>b</sup>   | 0.74           | 0.74           |
|                        |                | CfMb<sup>b</sup>  | 0.50           | 0.50           |
|                        |                | 6,755             |                | 6,755         |
|                        |                | 3,378             |                | 3,378         |

*a* Sources: Primary data analysis (2020)

* Field note: A = land suitable class area B=optimum area required for picnic , N= actual number visitor/day, T= average tourist activity duration, ST= service time of Masjid Lake, RF= Rotation factor, PCC=physical carrying capacity, RCC= Real carrying capacity, ECC=effective carrying capacity, Cfr = correction factor rainfall erosivity, CfP = correction factor of slope, Cfs = correction factor of soil erodibility and CfMb = correction factor of management.

* Unit of measurement note: v=visitors, d=day, h= hours, m= meter.

3.4. Economic valuation of ecotourism
The economic valuation analysis of ecotourism development in Masjid Lake, shown that the factors influence the frequency of tourist visits (tourist demand) to the Masjid Lake were travel costs and length of tourist visits, while age, income and tourist education wasn't significant. The relationship between the frequency of tourist visits and the cost of travel is negatives, meaning that the increases the travel costs, follows with decreases frequency of visits. Meanwhile, the relationship between the frequency of visits and the duration of tourist activity is positives which means that the longer the tourist activity causes the increases of frequency of tourist visits. The tourist demand curve model at Masjid Lake is expressed with this following equation:

\[ Q = 2.72867455 - 0.00001740 \times C + 0.19152741 \times T \]

Where \( Q \) is the demand for tourism or the frequency of tourist visits (visits / year), \( C \) is the travel costs incurred by tourists during a visit to Masjid lake (IDR/ trip) and \( T \) is the length of tourist activity in one visit (hours/ trip). By knowing the imminent curve, the tourist surplus value or willingness to pay (WTP) is available to estimated by calculated the integral of demand curve function. The integration process was used lower limit is minimum cost incurred by tourists and above limit value is maximum cost spent by tourists during a visit to Masjid Lake. Based on the results of interviews with visitors, it is known that the minimum cost spent by tourists is IDR 10,839 / trip, while the maximum cost is IDR 147,920 / trip. So that the tourist surplus value or WTP is obtained of IDR. 184,701 / trip (Table 10).

| Minimum Cost (IDR/trip) | Maximum Cost (IDR/trip) | WTP Value (IDR/trip) |
|------------------------|------------------------|---------------------|
| 10,839                 | 147,920                | 184,701             |

Table 10. WT estimation summary of ecotourism development in Masjid Lake a.

The actual economic value (AEV) ecotourism development in in Masjid Lake was expressed by multiply the WTP value with average tourist visits / year who come to the Masjid Lake = 19,710 visitors/year, so the AEV = IDR 3.64 billion / year. This actual economic value is smaller than the potential economic value (PEV) which multiplication result of WTP and ECC = 1,412,852 tourists / year, PEV= IDR 260.95 billion / year (Table 11). The direct economic value (DEV) received by ecotourism managers at Masjid Lake is still smaller AEC and PEC value, it held because the tourists who came are not charged entrance fees and parking fees. In fact, retribution of parking fees and entrance tickets can be used as financial input to improve current ecotourism destination by constructing more complete facilities & utilities and provide marketing system. It will increase the attractiveness and visit of tourists from various regions, both local and international tourists. Thus, the development of ecotourism will further contribute to improving the economy of the community around Masjid Lake. Optimization of ecotourism levy revenue can not only reduce pressure on ecotourism due to changes in market supply and demand, but can also help ecotourism destination areas to obtain ecological compensation funds [27].

Table 11. Economic valuation summary of ecotourism development in Masjid Lake a.

| Average annual visitor (visitors/y) | ECC (visitors/y) | WTP (IDR/y/tr) | AEV (IDR/y) | PEV (IDR/y) |
|------------------------------------|-----------------|----------------|-------------|-------------|
| 19,710                             | 1,412,852       | 184,701        | 3,640,448,175 | 260,954,516.671 |

a Sources: Primary data processing (2020)

3.5. Sustainable ecotourism management strategy

3.5.1. Sustainability status of ecotourism management in Masjid Lake. Based on the results of sustainable ecotourism management evaluation using MCA and SWOT-AHP. The criteria and indicators of sustainable ecotourism management produced by cross tabulation between management
dimensions (natural resource and cultural heritage management, human resource management and institutions and financial management) with the sustainability dimension (sustainability of economic, social and ecological functions) produced 16 C&I items with equal priority. Based on the analysis, it is known that the sustainability status of ecotourism management in Masjid Lake is classified in the low category with sustainability index = 40.0% of 5 scale or equal 1.8 (CIFOR, 1999). Based on SWOT-AHP analysis of internal and external environment of current ecotourism management shows that, the index value of strength (S) is 65.0% of the maximum scale 5, weakness (W) is 44.0%, opportunity (O) is 60.0% and threat (T) is 45.0%. The status of ecotourism management in Masjid Lake could be described in Cartesians coordinates \[(SW), (OT) = [(65.0 - 44.0 = 21.0), (60.0 - 45.0 = 15.0)] = (21.0, 15.0),\] placed in quadrant I as GROWTH status in the SWOT analysis scatter diagram [12] (Figure 3).

**Figure 3. Scatterplot of SWOT - AHP describes ecotourism management status in Masjid Lake.**

The factor analysis using the generalized boosted regression model (gbm), shown that the factors affect the sustainability status of ecotourism management in Masjid Lake are currently 38.5% influenced by human resource management and institutions, around 28.7% are influenced by financial management, while 19.9% are influenced by natural resources and cultural management. (Figure 4). The factor of human resources and institutional capacity determines a management process, especially in the allocation of financial and natural resources in achieving sustainable management [28].

**Figure 4. Graphic management dimension influences to sustainability status of ecotourism management in Masjid Lake.**

The sustainability status of human resource and institutional management of ecotourism in Masjid Lake categorized low with sustainability index=33.9%. The factors that affect the sustainability of the
human resources and institutional management were the level of local community participation (RI=26.8%), the availability of ecotourism management institutions (RI=22.3%), the competency of management staff (RI=21.0%) and compliance with regulations (RI=15.9%) (Figure 5). Currently the management of ecotourism in Masjid Lake still initiated by the Koto Kari village and Kuantan Singngi District government. On the other side, local community participation is still low and the management not supported by settle community-based ecotourism management institutions. The low of community participation and the absence of a management institution have hampered the development of ecotourism in Masjid Lake. Several fires due to the conversion of agricultural land have lowered the attractiveness of Masjid Lake. Increasing the participation of local communities in community-based ecotourism management institutions will produce perspectives and behaviours that support the achievement of conservation of natural and cultural resources [29].

Figure 5. Graphic C&I influences to sustainability status of human resources and institutional management of ecotourism in Masjid Lake.

The sustainability status of the financial management aspects of Masjid Lake categorized low with sustainability index of around 32.2%. The factors determine for the sustainability of the financial management aspects were largely determined by the accountability of financial resource management (RI=60.8%), followed by marketing of ecotourism (RI=25.6%) and increasing the local economy (RI=13.5%) (Figure 6). The Ecotourism management of Masjid Lake was still carried out independently without imposing entrance and parking fees to tourists. Funding sources for management still depend on local government budgets. Without income from ecotourism activities, the sustainability of ecotourism development in Masjid Lake will be difficult to materialize. The ecotourism development in Masjid Lake was also not supported by a good ecotourism marketing system, this is indicated by the number of tourist visits that are still lower than the potential carrying capacity available. An accountable financial management system through management of revenue and expenditure budgets as well as a good marketing system will improve the sustainability of the ecotourism management of Masjid Lake in the future. Ideally, ecotourism development requires an optimum number of investment and marketing funds for the development of ecotourism based on natural resource conservation. Ecotourism activities will have a positive economic impact on managers and local communities. However, the management of this financial aspect requires preventive action against misuse of funding through accountable financial management [30].
Based on the results of the analysis, it is shown that the sustainability status natural resources and cultural management in Masjid Lake classified moderate with sustainability index = 53.9%. Strong factors affecting the sustainability status of the dimensions of natural resources and cultural management were land suitability planning (RI=20.9%), environmental carrying capacity planning (17.8%) environmental interpretation programs (17.2%), local knowledge and wisdom (14.8%) and natural resource protection (13.2%) (Figure 7). Currently, ecotourism management in Masjid Lake has not been supported by an integrated ecotourism management plan that considers suitability, environmental carrying capacity and the economic valuation of ecotourism. This causes the managers not have sufficient information to establish an ecotourism development programs that is able to balance the interest of tourists with the land suitability - carrying capacity of the environment. A further implication due to this lack of integrity causes the managers to be unable to increase the number of tourist visits. Meanwhile, on the one hand, social activities around Masjid Lake very intensive that required prevention against damage to natural resources. Integrated sustainable planning using information on land suitability, carrying capacity and economic valuation can become guidance to create a roadmap for achieving a more sustainable ecotourism management [31]. The implementation of an ecotourism management plan linked to national development can be done by integrating it with development in the other sectors (cross-sectoral) and also integrating it in a cross-structural development hierarchy (district-provincial-central government). It aims to achieve synergy in the development of ecotourism in the concept of sustainable national development [32]. Inline with the concept of village development, ecotourism development can be carried out by developing a tourism village business through the establishment of village-owned enterprises that involve active community participation [33].

3.5.2. Sustainable ecotourism management strategy in Masjid Lake. Based on the sustainability evaluation and the results of the SWOT-AHP analysis, shown that the current situation of ecotourism
management in Masjid Lake yet optimal. However, management potential in the future is in a favourable situation. Existing ecotourism management has great potential strengths and opportunities so that it can be utilized to reduce weaknesses and overcome threats. So, the strategy that must be applied in this condition is to support a rapid growth strategy (Figure 2). By considering the situation of strengths and opportunities along with the factors that affect the management dimension (Figure 3-7) in a more profitable direction, rapid growth-oriented strategies that can be developed to reduce weaknesses and overcome threats in improving ecotourism management in Masjid Lake were as follows:

1. Established an integrated sustainable ecotourism management planning (ISEMP) of Masjid Lake by taking into account the aspects of suitability, environmental carrying capacity and integrated economic valuation across sectors and structures (village, district, provincial and national governments) as well as the application of collaborative management in community-based ecotourism management accompanied by strengthening of the Masjid Lake ecotourism management institution. This can be integrated with village development programs in the form of the establishment of village-owned ecotourism enterprises

2. Using the ISMEP as the basis for the feasibility of developing an community based ecotourism management in Masjid Lake to obtain an investment allocation for enhances current ecotourism facilities and utilities and increasing the attractiveness and competitiveness of ecotourism products

3. Increase staff capacity and community participation for innovation in ecotourism development continuously at Masjid Lake by collaboration with universities, research institutions and private companies in Riau Province

4. Implement a digital-based ecotourism product marketing system by considering the ecotourism demand or market trend

5. Improve the ecotourism management accountability system which is integrated to village development program and build a reputation continuously for ecotourism market increment.

4. Conclusion

Based on the analysis, the conclusions that can be drawn from this study are as follows: (1) The area of the Masjid Lake classified as suitable for ecotourism development is 21.87 ha or 95.1% of the total area, meanwhile, 1.1 ha (4.9%) is land that is not suitable land. From 21.87 ha of land suitable known that the PCC value = 9,574 visitors/day, RCC = 6,755 visitors/ day and the ECC value = 3,378 visitors / day. The actual tourist visits around 54 visitors/day was not exceed the environmental carrying capacity; (2) The willingness to pay (WTP) value of tourists visiting Masjid Lake is IDR 184,701/ visit/year, while the current actual economic value of ecotourism development was around IDR 3.64 billion / year, which still smaller than the available potential economic value around IDR 260.95 billion/year; (3) Based on management evaluation using AMK and SWOT - AHP analysis, it is known that the sustainability status of ecotourism management in Masjid Lake classified as low category with a sustainability index of 40%. However, the analysis of internal and external factors shows that the management of ecotourism in Masjid Lake in the future will be in a favorable situation because it has more strengths and opportunities than weaknesses and challenges. The strategy that must be used to improve ecotourism management in the Majid Lake is a rapid growth-oriented strategy, namely using the existing strengths and opportunities to eliminate weaknesses and challenges. This strategy can be implemented through: (1). Established an integrated sustainable ecotourism management planning (ISEMP) that accommodates all aspects of sustainable ecotourism development; (2) Using ISEMP as the basis to assess the feasibility of community based ecotourism management in Masjid Lake; (3) Improve staffs capacity and community participation for continuous ecotourism development innovations; (4) Implementing a digital-based ecotourism product marketing system by considering the trend of ecotourism demand; and (5) Increasing the accountability management system that is integrated to village development program and building reputation to tourists continuously.
Greeting note
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