Assessment of the Economic Value of Mangrove Resources

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ABSTRACT

Mangrove resource that people often visit, has characteristics that are quite vulnerable to environmental disturbance. Maroon Mangrove Edupark is a mangrove resource in Semarang, located close to Maroon beach and Ahmad Yani International Airport. The presence of mangroves in Maroon Mangrove Edupark, is expected to protect Maroon coastal area and the airport from the coastal disaster, as well as to make it as a new sustainable ecotourism site. This study assessed the benefits of mangrove resource in Maroon Mangrove Edupark according to visitor perception, and provide the economic valuation toward mangrove plantation in there. Economic valuation measurement employed was TCM (Travel Cost Method). The economic surplus value per individual per visit is Rp 173.010,00. The value indicates the benefits of environmental services greater than the cost incurred. Besides that, only 35,54% of mangrove forest has been utilized. For optimalizing the values, increasing the number of mangroves were planted along with maintenance should be done.

Keywords*: Mangrove, Economic Valuation, Environment, Maroon Mangrove Edupark*

ABSTRAK

Sumber daya mangrove yang sering dikunjungi masyarakat, mempunyai karakteristik yang cukup rentan terhadap gangguan lingkungan. Maroon Mangrove Edupark merupakan salah satu sumber daya mangrove di Semarang yang terletak dekat dengan pantai Maroon dan Bandara Internasional Ahmad Yani. Kehadiran hutan mangrove di Maroon Mangrove Edupark, diharapkan dapat melindungi kawasan pantai Maroon dan bandara dari bencana pesisir, serta menjadikannya sebagai lokasi ekowisata baru yang berkelanjutan. Penelitian ini menilai manfaat sumber daya mangrove di Maroon Mangrove Edupark menurut persepsi pengunjung, dan memberikan penilaian ekonomi terhadap penanaman mangrove di sana. Metode pengukuran valuasi ekonomi yang digunakan adalah TCM (Travel Cost Method). Nilai surplus ekonomi per individu per kunjungan sebesar Rp 173.010,00. Nilai tersebut menunjukkan manfaat jasa lingkungan lebih besar dibandingkan biaya yang dikeluarkan. Selain itu, hutan mangrove yang dimanfaatkan baru sebesar 35,54%. Untuk mengoptimalkan nilai tersebut, perlu dilakukan peningkatan jumlah mangrove yang ditanam disertai perawatannya.

Kata kunci*: Mangrove, Valuasi Ekonomi, Lingkungan, Maroon Mangrove Edupark*

INTRODUCTION

Mangroves play a vital role in protecting the sea currents and sea waves along the coastline (Bohol, 2015). For instance, the presence of mangroves in Semarang, one of the cities in Central Java province in Indonesia. Semarang has 13.6 km coast line and 62.5%

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of its territory is coastal area or lowland. This geographical feature makes Semarang be prone to coastal floods, abrasion and other natural disasters types around coastal areas (Wahyuningtyas et al., 2017) Under these conditions, Mangrove forests in coastal areas of Semarang are crucial in shaping the ecology and economy of Semarang (Diarto et al., 2012; Martuti, 2022).

Natural tourism activities and package with forest and sea views combined, as well as souvenirs made of processed mangrove, can give economic value added. It increases the income of local community (Widnyana et al., 2016; Suryasih & Anom, 2023). One of the most visited mangrove forests in Semarang is Maroon Mangrove Edupark. Maroon Mangrove Edupark is located in Tugurejo Urban Village, Tugu Sub-District, Semarang. The forest is in the area of Army Main Air Base Ahmad Yani, Semarang, which is around 1.5 kilometers from Ahmad Yani Airport. The presence of mangroves in Maroon Mangrove Edupark, is expected to protect Maroon coastal area and the airport from the coastal disaster. Furthermore, Maroon Mangrove Edupark also offers excellent views of commercial aircraft landing at and departing from Ahmad Yani Airport. The view of mangrove and aircraft in one frame mesmerizes most visitors.

Mangrove resource that people often visit, has characteristics that are quite vulnerable to environmental disturbance (Asari et al., 2021). Despite the ambition, the increasing number of visits might lead to decreased quality of natural resources and environment. The condition might point to economic inefficiency (Kill, 2015). Therefore, it is essential to assess the value or price toward the impact of environmental activities. The assessment of a natural site indirectly determines the development of the sights themselves (Spacek & Antouskova, 2013). The aim of this study was to provide the economic valuation toward mangrove plantation in the Maroon Mangrove Edupark. In addition, the aim was to determine the benefits of mangroves addition in that place according to visitor perception.

LITERATURE REVIEW

Tourism plays a crucial role in the advancement of the economy, promoting growth on a national scale (Sharma et al., 2012). This impact extends to the encouragement of emerging industries linked to tourism services, such as transportation and lodging enterprises (such as hotels, motels, and tourist accommodations) Moyle et al. (2020). Additionally, tourism fosters the expansion of markets for local tourism products and generates new job opportunities across diverse sectors, including hotels, travel agencies, government offices dedicated to tourism, translators, handicraft and souvenir industries, and various retail establishments. Furthermore, tourism contributes to the development of remote areas, especially when these areas possess appealing tourism features (Katili et al., 2023; Germanovich, 2020). Tourism is considered a type of service export, positively impacting a country's balance of payments. The enhancement in the exchange rate between domestic and foreign countries can, however, negatively affect the terms of trade, as exports become pricier. The rise in tourism revenue also intensifies competition for imported goods among the tourism sector and other industries within the domestic economy. (Menegaki et al., 2021; Stauvermann & Kumar, 2017)

Typically, tourist areas include non-market goods which are not bought or sold directly on markets and therefore do not have an associated market price (Wahyudi, 2019). When goods and services lack a market presence, their assessment remains essential to evaluate their impact as a component of policy or project evaluations. Evaluate the impact can be done by doing economic valuation. Economic valuation aims to assign a numerical value to the goods and services generated by natural resources and the environment, even in cases where market value is not readily available for these goods and services (Katili et al., 2023). Tourist sites require conservation and preservation against the damages that can be caused by exceeding their carrying capacity and irresponsible human actions towards the features of the site. Consequently, the economic valuation of tourist sites should be based on consumption behavior (VanBlarcom & Backman, 2007). Establishing the economic value allows for more conscientious use and sustainable management of

tourist areas, ensuring their protection and transmission to future generations (Suer & Sadik, 2020). There are appropriate non-market valuation methods to estimate the true economic value of the tourist sites, one of them is Travel Cost Method (TCM). TCM is a non-market economic valuation technique that provides to obtain a value on sites by using consumption behavior in related markets. This method has gained broad acceptance and is commonly recognized as one of the prevalent and effective non-market economic valuation techniques for tourist sites (Suer & Sadik, 2020; Nobi et al., 2021). There are primarily two categories of TCM, namely Individual and Zonal TCM. In the Individual Travel Cost Method (ITCM), the dependent variable is the annual number of trips made by individual users to a site, making it suitable for local and frequently visited sites. Conversely, the Zonal Travel Cost Method (ZTCM) employs the number of trips to the site by the population of a specific zone as the dependent variable, making it more suitable for sites infrequently visited by individuals from other zones (Nobi et al., 2021; Firdaus et al., 2023).

METHOD

This study was conducted in Maroon Mangrove Edupark during February 2019. Economic valuation measurement employed was Travel Cost Method (TCM). Questionnaire was used as instrument of data collection which contained some variables such as the number of visits (y), travel cost (x1), income (x2), distance (x3), visit duration (x4), and quality of environment (x5). The respondents were as many as 104 people taken in the basis of accidental sampling. The profile of respondents is the visitor who has visited Maroon Mangrove Edupark and must age 20-60 years. TCM is one of the methods of economic valuation of indirect measurement. This study used TCM with individual approach, conducted by Spacek & Antouskova (2013). The analysis applies primary data obtained through surveys and statistical techniques. The advantage of this method is that the result become relatively more accurate than that of zoning approach.

Data that has been collected were changed to multiple linear regression model. The multiple equations of linear equations were obtained from the processing the individual data of TCM, converted into Trip Generation Function (TGF). The other variables other than number of visits and travel expenses in this regression equation are assumed to be fixed, i.e. used the average value (Thill & Kim, 2005). Calculation of economic surplus and the potential economic value of mangrove, Gailis (2012) calculating the integral of TGF at first. Those results can be used as a basis to determine the appropriate sustainable management and development strategies.

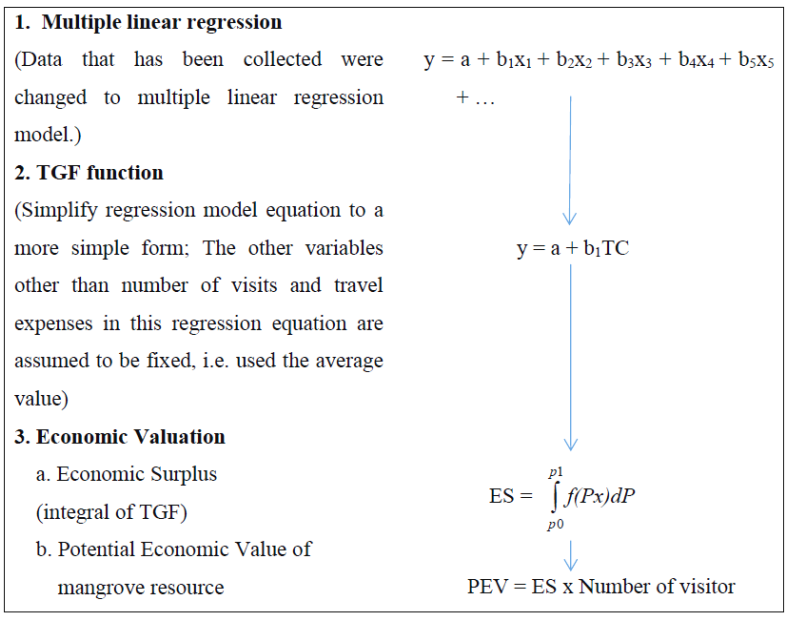

Figure 1. Summary of data calculation

RESULTS

Results of qualitative environmental assessment are presented in Table 1, assessment are defined by people's judgments and perceptions on environmental conditions in Maroon Mangrove Edupark. Variables assessed include mangrove maintenance, temperature, odor intensity, wind strength and noise. The assessment results show that the majority of visitors consider mangrove maintenance to be good, the air temperature is considered cool, the intensity of the smell is faint, the wind strength is considered calm, and the atmosphere is calm without excessive noise. The percentage of visitors who gave a positive assessment of each variable ranged from 79% to 90%.

Table 1. Summary of qualitative environmental assessment.

Variable	Value	% visitors
Mangrove maintenance	Good	79
Temperature	Cool	80
Odour Intensity	Faint	87
Wind strength	Calm	90
Noise	Quiet	90

After that, other data that has been collected were changed to multiple linear regression model. Multiple linear regression analysis results are presented in Table 2.

Table 2. Summary of multiple linear regression analysis.

Variable	Average	Coefficient	t Value	F Value
Constant		0.069		6.668*
x_1	61.480.597	$-1.235.10^{-5}$	-2.772*	
x_2	2.750.000,000	$3.337.10^{-7}$	1.689	
x_3	31.596	-0,011	-2.519*	
x_4	109.038	0.017	3.441*	
x_5	19.803	0.041	0.639	
y	1.540			

* significant at the 5% level

In Table 2, a summary of the results of the multiple linear regression analysis carried out on the data that has been collected is presented. From the results of this analysis, it was found that variables x1 and x3 showed a significant influence on the results at a significance level of 5%. That is, changes in variables x1 and x3 correlate with significant changes in the regression results. In addition, the x4 variable also shows significance, although at a stricter level, namely 1%. This indicates that the variable x4 has a significant impact on the regression results at a higher level of significance. The variables x2 and x5 do not show a significant effect at the 5% significance level, which means that changes in these variables do not significantly affect the regression results.

The results of the regression analysis in Figure 2 are used to build a General Function Theory (TGF) which can be used to describe the relationship between various variables involved in a phenomenon.

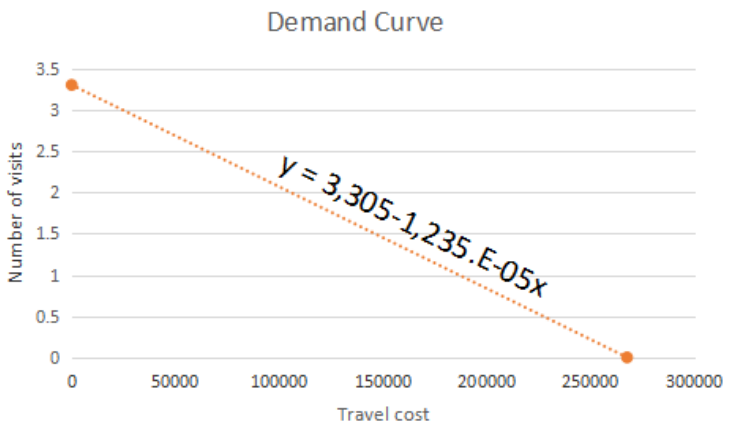

Figure 2. Demand curve

The visitor demand curve shown below is one form of application of TGF. The curve reflects the level of visitor demand. By using the results of regression analysis, variables can be identified that have a significant influence on visitor demand and build a mathematical model that explains the relationship between these variables. The demand curve resulting from the TGF is used as a prediction and modeling tool to assist in decision making and strategic planning in various fields, such as business, economic and environmental management.

DISCUSSION

The individual travel cost model included the independent variables of travel costs, income, distance, visit duration, and quality of environment. The results of the analyzed model proved that the negative influence of travel cost and distance on the number of visits. Similar results have been proven by Spacek & Antouskova (2013) and Gurluk & Rehber (2008). The results also proved that the variables of income, visit duration and quality of environment have a positive correlation with number of visits. Based on the results above, it can be observed that various factors influence the number of visits to Maroon Mangrove Edupark. Firstly, lower travel costs correlate with increased visitation rates. Secondly, an increase in income levels tends to result in higher visitation numbers. Thirdly, proximity to residential areas appears to positively impact the frequency of visits. Additionally, visitors' tendency to spend longer durations at the park is associated with higher visitation rates. Lastly, improvements in environmental conditions, such as the addition of mangroves, contribute to an increase in the number of visits.

The positive correlations of visit duration and quality of environment with number of visits, as shown in Table 1, imply that mangroves have a very crucial role in restoring the environment of Maroon area. The visitors got comfort to linger in Maroon Mangrove edupark. They could enjoy the natural beauty of the mangrove forest while they breathed fresh air. 80% of the respondents acknowledged that the existence of mangroves gets Maroon area cooler and help the environment by reducing air pollutant substance level. The quality-air comes from the number of mangroves that are huge in size and owns dense leaves, which can absorb pollutants and produce oxygen so that the air produced are cleaner, cooler and fresher (Faridah et al., 2009). Amounted to 90% of respondents agreed that the addition of mangroves can reduce the level of noise in the Maroon Mangrove Edupark. Although Maroon Mangrove Edupark is located close to the end of the run way of Ahmad Yani Airport, visitors did not disturb by aircraft noise. This is because the physical feature of mangroves in that forest are high and dense. According to Dobson & Ryan (2000), the condition of such trees is able to reduce 5-10 dB noise.

Based on the integral calculation of TGF, with the lower limit of the lowest travel cost of Rp 12.500,00 and the upper limit of the highest travel cost of Rp 172.500,00, it is known that economic surplus value amounts to Rp 346.020,00 / individual / year. The average number of visits in the past year known as much as two times, thus the economic surplus

value was Rp 173.010,00 / individual / visit. This value is greater than the average actual cost incurred by visitors, which is merely Rp 61.480,597 / individual / visit. When compared, between the value of economic surplus and the actual value incurred visitors, it can be seen that visitors get the benefits of environmental services greater than the cost incurred. Based on these calculations, it can be seen that the presence of mangroves in Maroon Mangrove Edupark has a great benefit for visitors. However, only 35,54% of mangrove forest has been utilized. It means the potential of mangrove itself still has a room for improvement. The value can be increased by increasing the number of mangroves were planted along with maintenance. The abundance of mangroves can be used for environmental, education, and agribusiness functions, so that its existence can remain sustainable.

CONCLUSION

Based on the research results, it can be concluded that the Mangrove Maroon Edupark individual travel cost model involves independent variables such as travel costs, income, distance, duration of visit, and environmental quality. The results of the model analysis show a negative influence of travel costs and distance on the number of visits, a result that is in line with previous research. The variables income, length of visit, and environmental quality have a positive relationship with the number of visits. Several facts can be drawn from these results, including the number of visits increases when travel costs are low, income growth can increase the number of visits, and good environmental quality also contributes. The positive correlation between visit duration, environmental quality, and number of visits shows the important role of mangroves in restoring the environment in the Maroon area. Visitors acknowledge the comfort of spending time at Maroon Mangrove Edupark, and the presence of mangrove forests helps reduce noise levels and improve air quality. The potential for mangrove utilization is only 35.54%, showing the potential for improvement with further planting and maintenance. The existence of mangroves in Maroon Mangrove Edupark provides great benefits, and the potential of mangroves can still be increased to ensure the sustainability of their function in the environment, education and agribusiness.

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