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Suitability of Coastal Tourism Based on the Aesthetics of the Coastal Landcape at air Manis Beach, Padang City, Indonesia

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ABSTRACT

Air Manis Beach is one of the tourist beaches in Padang, West Sumatra, Indonesia. The position of the Air Manis beach facing the Indian Ocean in the west which can see the sunset and the beach is located behind a hill which makes the beautiful scenery and the legend of the Malin Kundang stone the main attraction for tourists. This study aims to determine the value of the aesthetic quality of the Air Manis beach scene based on the physical parameters of its constituent. The research was carried out from December 2021 to July 2022 in the Air Manis coastal tourist area, Padang City, West Sumatra. The method used is the method of observation and literature study and analysis is used to solve research problems, namely the euclidean classification. The results showed that this beach has a low aesthetic quality value. In general, Air Manis beach can be developed into beach tourism.

Keywords: aesthetic quality, Air manis beach, beach tourism, euclidean classification

1. INTRODUCTION

Coastal and marine tourism is quite promising in Indonesia. Ranked among the largest archipelago countries in the world, the country has more than 17,000 islands and a long coastline. Tourists who visit are mostly attracted to this country because of the beauty of its beaches and the diversity of marine life.

Coastal and marine areas are areas that have large natural resource potential and can be utilized to increase development. The development of tourist areas must lead to comprehensively planned development so that optimal benefits can be obtained for the community [7].

One of the resources possessed by coastal and marine areas is environmental services, including the function of coastal and marine areas as recreation and tourism areas. The beauty or aesthetics of a landscape is determined by environmental characteristics and is highly dependent on human judgment [7]. The aesthetic appeal of natural landscapes for tourism is one of the important intangible ecosystem services [6]. Landscapes play a major role in providing ecosystem services in coastal areas that have recreational appeal and conservation value [17].

Various studies have been conducted on the attractiveness of beaches for visitors around the world showing that almost all beaches with the highest scenic value are located in protected coastal natural areas [1-5, 8, 11-16].

Air Manis Beach is a beach located approximately 10 km south of the center of Padang City, West Sumatra. The location is behind Mount Padang or to be precise in Air Manis Village, South Padang District, Padang City. This beach is a popular tourist destination which is always crowded with people. Air Manis Beach has beautiful and natural sea views which can attract tourists to visit. Apart from its pristine beaches, this beach is also known for the legend of the Malin Kundang rock area.

Landscape views are a parameter of aesthetic quality which is the reason tourists visit an area. Aesthetic qualities relate to views and are often associated with ease of access to nature.

Good views are not limited to natural features such as the sea or forest [19]. An assessment of beach aesthetics is important to determine its attractiveness and potential [22].

Therefore, it is necessary to carry out an analysis regarding the suitability of beach tourism based on the aesthetics of the coastal landscape at Air Manis Beach, Padang City as an effort to plan, utilize, protect and develop sustainable beach tourism.

2. RESEARCH MATERIALS AND METHODS

This research was conducted at Air Manis Beach, Padang City, West Sumatra, geographically this location is located at coordinates 0°59' -2°28.6' South Latitude and 100°19' - 101°18' East Longitude. The research was carried out in December 2021 and data processing was carried out in that month, January-July 2022.

This research uses field surveys and direct visual observation. Some parameters cannot be observed visually, but can be measured directly or searched for related secondary data. The data used to assess the aesthetic quality of the beach are physical parameters, namely the appearance facing the sea, including wave data, tidal data downloaded from BIG <http://tides.big.go.id>, watercolors, water objects. Appearance views towards land including cliffs, beaches, rocky shores, sand dunes, coastal vegetation and coastal landscape features were carried out directly.

The analysis used in this research uses Euclidean classification analysis, where there are 4 class categories, namely very low, low, high and very high which indicate the aesthetic level of a coastal area.

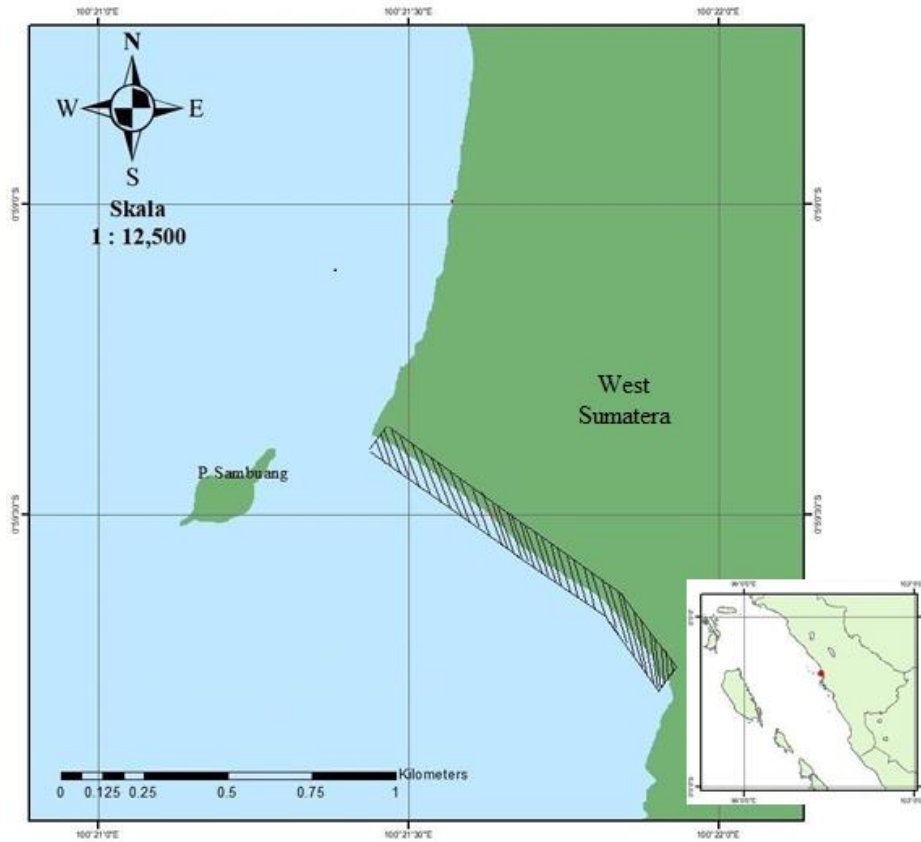


Figure 1. Location, West Sumatra

Table 1. Scene Parameter Score

Views towards the sea		Criteria Score				
Parameter		1	2	3	4	5
Wave	Type	<i>Plunging dan collapsing</i>		<i>Spilling</i>		<i>Surgings</i>
Tidal Wave	Type	Semi diurnal tide and mixed tide prevailing semidiurnal		mixed tide prevailing diurnal		Diurnal tide
	Tidal range	<i>Macro</i> (>4m)		<i>Meso</i> (2-4m)		<i>Micro</i> (<2m)

Water Color		Black or muddy brown	Dark green	Bright green or dark blue	Light blue Biru terang	Clear
Objects in Water		Permanent building	Semi-permanent buildings (wooden dock)	None	A stretch of rock or sea cliff	Group of islands
View towards the land						
Cliff	Height (m)	None	5 sd 30	30-60	60-90	>90
	Slope (°)	None	45	60	75	90
	Special Feature	None	1	2	3	>3
Beach	Tip	Estuaries	Muddy	Large Rocks	Gravel	Sand
	Width (m)	None	< 5 ; > 100	5 sd 25	25-50	50-100
	Color	None	Black or dark	Light brown	Light grey	White or brignt
Rocky beach	Slope (°)	None	<5	5-10	10-20	>20
	Area (m)	None	<5	5-10	10-20	>20
Sand dune		None	Foredune beginning	foredune 1	foredune 2	foredune 3&4
Beach vegetation		Estuarine plants	Shrubs	Meadow	Young or low tree	Old or tall tree
Coastal landscape features*		None	1	2	3	>3

Euclidean Algorithm [19]:

$$E = \sqrt{(M - 1)^2 + (T - 1)^2} \dots\dots\dots (1)$$

$$M = \frac{\sum_{i=1}^N \frac{mi}{di}}{\sum_{i=1}^N \frac{1}{di}} \dots\dots\dots (2)$$

$$T = \frac{\sum_{i=1}^N \frac{ti}{di}}{\sum_{i=1}^N \frac{1}{di}} \dots\dots\dots (3)$$

where:

- E : Seascape Aesthetic Quality Index
- M : Viewed from Land to Sea Value
- T : Viewed from sea to land value
- mi : Ocean Appearance Parameter Score
- ti : Land View Parameter Score
- di : Data Quality

Table 2. Data Quality (Patrick et al., 2019)

Score (di)	Data Quality	Description
1	High	Measurement data covering all parameters is taken at a new time
2	Cukup	New measurement data, but does not include all parameters or modeling data
3	Limited	Data is like scores 1 and 2, but measured in the past
4	Very Limited	Data taken from general literature or based on expert opinion without specific measurements
5	None	-

The results of the Euclidean algorithm are classified using the aesthetic quality index or using Euclidean graphs. Classification using Euclidean graph is obtained by posting 'M' and 'T' values on the axes of Euclidean graph. Euclidean classification is useful for showing the distribution of values.

The results of Euclidean calculations will be classified using Euclidean graphs. M (Viewed from Land to Sea Value) and T (Viewed from sea to land value) are the axes of the Euclidean graph obtained from the Euclidean algorithm and the distribution values are shown.

Table 3. Classification of Aesthetic Quality Index

Euclidean Distance (E)	Aesthetic Quality
0 – 1,41	Very Low
1,42 – 2,83	Low
2,84 – 4,24	High
4,25 – 5,65	Very High

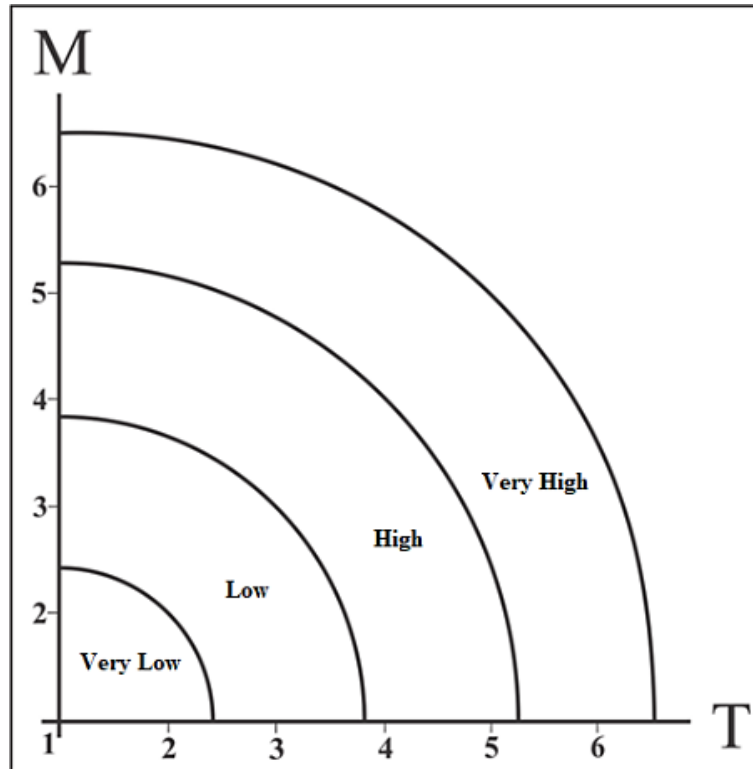


Figure 2. Euclidean Graph [19]

Oceanographic Data Processing for Seaward Appearances :

- a. Classification of breaking wave types. Wave type is needed as an input to calculate aesthetic quality. Classification of breaking wave types using the calculation of the Iribarren number (Ni),

$$Ni = \frac{\tan \beta}{\sqrt{\frac{H}{Lo}}}$$

$$Lo = \frac{gT^2}{2\pi}$$

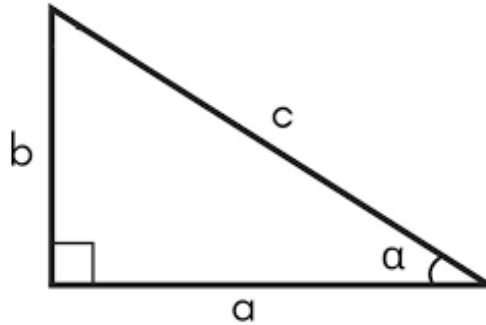
where:

- Ni : Surf Similarity (Iribarren Number)
- β : Beach slope
- H : Deep sea wave height
- Lo : Deep sea wave length
- g : Earth's gravitational acceleration (9.8 m/s)

With these parameters, the types of breaking waves can be differentiated as follows:

$N_i < 0,4$: spilling
 $0,4 < N_i < 2,3$: plunging
 $2,3 < N_i < 3,2$: surging

- b. Beach Slope. To determine the slope of the beach, trigonometry formulas are used to get the beach slope results with the formula:



$$\alpha = \arccos \frac{a}{c}$$

where :

α : angle
a: adjacent side
c: hypotenuse

3. RESULTS AND DISCUSSION

Based on Table 2, the view parameters towards the sea in the research area, the type of breaking wave at the research location is spilling with the irribaren number $N_i = 0.006856$ and the score criteria is 3. Spilling type usually occur when waves with a small slope head towards a flat beach. The waves begin to break at a considerable distance from the coast and the breaking occurs gradually. Foam occurs at the crest of a wave during breaking and leaves a thin layer of foam at quite a long distance. This type of spilling breaking wave is termed "mushy or crumbly" because it describes a wave that is slow and consistent. The waves are relatively slow and consistent and are suitable for beginner surfers who are just starting to learn to surf. Air Manis Beach has the potential to be used for surfing activities intended for beginner surfers.

Tidal data was obtained from the Geospatial Information Agency (BIG). The results of tidal data processing for June 2021 show a formzahl figure of 0.88. This shows that the tidal type at Air Manis Beach has a mixed daily tidal type which tends to double every day (score criterion 1), a tidal value of 31.2 cm and a micro tidal type (score criterion 5). The tides of sea water greatly influence beach tourism activities, because the tides of sea water will affect the area of the beach used for beach tourism activities. At the highest tide, the width of the beach that can be used for tourism activities will decrease because the beach will be submerged in water. Meanwhile, at low tide, the width of the beach that can be used for tourism will increase because the beach is not submerged in water. The tides can also be used for surfing activities

for tourists. Apart from that, tides are also a safety factor that needs to be considered when visiting coastal tourist areas.

The results of observing the parameters of objects in the waters show that at the research location there is a group of islands (Pisang Besar Island and Pisang Kecil Island), so it is assessed as having a score of 5 criteria. The group of islands is considered to have high score criteria, because not all beaches have a group of islands in their waters and are considered to really attract the attention of tourists (Figure 4). Pisang Kecil Island is an uninhabited island measuring around 2.8 hectares and is unique because it is an object in the water. The distance from Air Manis Beach is around 200 meters. By taking advantage of tidal wave conditions, Pisang Kecil Island can be visited by tourists to stop by without having to rent a boat. The water height ranges from 20 cm at low tide to around 1.2 meters at high tide. Apart from panoramic views of the beach and sea, from a distance visitors can also see views of Mount Padang which is located on the north side of the island. Apart from that, there is Pisang Besar Island which is an inhabited island measuring around 25 hectares, about 2 km from Air Manis Beach and can be reached by motorboat in about 15 minutes.



Figure 3. Water Color



Figure 4. Island group objects



Figure 5. Cliffs, Beach Type, and Beach Width, Air Manis Beach

The view parameters towards the mainland of this beach have a cliff (Figure 5) with a height of 31.6 m with a slope of $16,82^\circ$ (score criteria 2), with light brown sandy beach type (score criteria 4). Regarding the type of beach, it would be very good if the beach was sandy or in other words dominated by a sand substrate, compared to a rocky beach or a beach dominated by a coral substrate, because it could disturb the comfort of tourists. The width of the beach is quite wide, around 118 m (score criteria 5). The width of the beach greatly influences the activities carried out by tourists.



Figure 6. Rocky Coastal Vegetation



Figure 7. Coastal Landscape Features

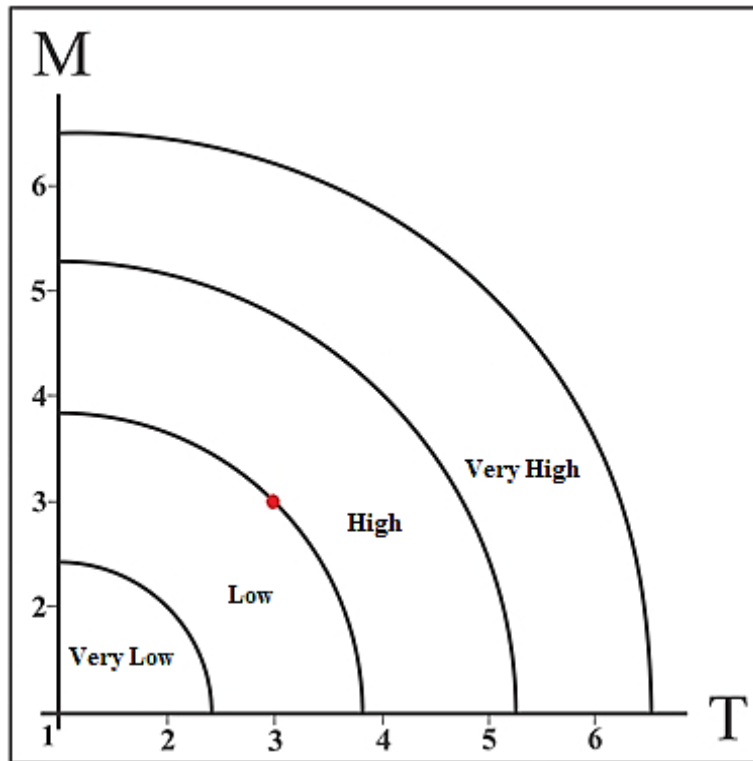


Figure 8. Graph of Euclidean calculation results

Air Manis Beach has a rocky coastal area in the south with an area of <5 m and a slope of 5° (score criteria 2). The vegetation that grows on the beach is in the form of old or tall tree vegetation (score criteria 5) which is shown in Figure 6. According to the Minister of Public Works No. 5 of 2008 concerning tall trees are trees that have an adult height of more than 12 meters. There are also coastal landscape features in the form of 2 rivers connected to the land area which, when high tide occurs, water will fill into this river (Figure 7).

Coastal landscape features can be peninsulas, caves, deltas, waterfalls, rivers, etc. Not all beaches have coastal landscape features. Air Manis Beach has a coastal landscape feature in the form of a river. There are two rivers connected to the sea.

The calculation results show that the seaward parameter score (M) is 3, the landward parameter score (T) is 3, the aesthetic quality index (E) is 2.82, which is in the low category. This measurement is based on waves, tides, water color, objects in the water, cliffs, beach type, rocky shore, beach vegetation and coastal landscape features. Assessing the level of aesthetic quality based on these physical parameters as a whole, Air Manis Beach has low aesthetic quality, but this beach has great potential to be developed as a beach tourism.

The results of the Euclidean algorithm classification show that Air Manis Beach has low aesthetic quality. Several factors causing the low aesthetic quality assessment are the low assessment of the condition that there are no sand dunes, special features on the cliffs that are assessed as lacking, as well as the condition of the sea color and mixed tidal types which tend to be double daily.

Table 4. Analysis of Aesthetic Quality

Parameter		Criteria Score	Data Quality
Views towards the sea			
Wave	Type	3	2
Tidal Wave	Type	1	2
	Tidal range	5	1
Water Color		1	1
Objects in Water		5	1
View towards the land			
Cliff	Height (m)	3	1
	Slope($^\circ$)	2	1
	Special Feature	1	1
Beach	Type	5	1
	Width (m)	5	1
	Color	4	1

Rocky beach	Slope (°)	2	1
	Area (m)	2	1
Sand dune		1	1
Beach vegetation		5	1
Coastal landscape features*		3	1

The presence of sand dunes and special features on cliffs can be a special attraction for tourists because they are geologically unique and have a beautiful natural landscape that can be utilized by the community to improve their welfare as a geotourism attraction. Apart from being a cultural site and ecological geotourism object, it is also a place for the development of unique flora and fauna, functions to protect coastal erosion and mitigate tsunami disasters.

The color of sea water is not always blue and bright, this is due to the influence of depth, phytoplankton, algae, dissolved substances, runoff from rivers and the condition of the seabed. White sand seabed will make the color of the sea water lighter and black sandy seabed will make the water look darker.

Tides are an important factor that needs to be considered. Tide when the water level is high and low tide when the sea level falls. At high tide, water play activities on the beach will be limited, because of the strong and high waves. When the sea water is high, the activity you can do on the beach is surfing. When the sea water is high, limit playing activities on the beach and also limit activities to enjoy the view. With the mixed tide type that tends to be double daily at Air Manis beach, of course it limits the activities carried out while traveling. Tourists must be able to adapt to tidal conditions that occur twice as high and twice as low in a day or sometimes there is one high and one low with different heights and times.

Even though the aesthetic quality of Air Manis Beach is of low value, it has the potential to be used as a beach tourism activity that can attract tourists to visit to enjoy the beauty of the natural landscape. This can be seen from data on the number of visitors to Air Manis Beach obtained from the Padang City Tourism and Culture Office. An increasing trend in the number of visitors occurs at Air Manis Beach. A significant increase in the number of visitors from 2017 to 2019. In 2020 there was a decrease in visitors due to the Covid-19 pandemic. However, the number of visitors began to increase after the pandemic ended.

This tourist destination has developed and has strategic potential to encourage regional development and contribute to regional and state income [21]. However, the rapid development of tourism can cause various environmental problems, one of which is the problem of waste, which is generated from tourism activities. Tourism and recreation activities cause large amounts of plastic waste to be dumped along beaches and coastal resorts [10].

Garbage is a serious problem because if it causes pollution in waters, it is feared that it could become a threat in many ways which have implications for social and environmental conditions. Waste that is not managed properly can become a serious threat to the continuity and preservation of natural tourist areas.

Community involvement and integrated coastal area management is one management model that is considered to be able to raise awareness of marine waste management [18]. Community involvement includes building knowledge about marine debris, its consequences

for humans and the environment, as well as increasing community participation in cleaning and caring for the environment [20]. Several important things that need to be considered and implemented to solve the marine waste problem are education, providing adequate waste facilities, enforcing regulations and changing behavior towards a more environmentally friendly direction [18]. Beaches that are clean from plastic waste provide amenity value which can provide a feeling of relaxation, increase pleasure for those who look at them, and minimize the risk of disease related to hygiene.

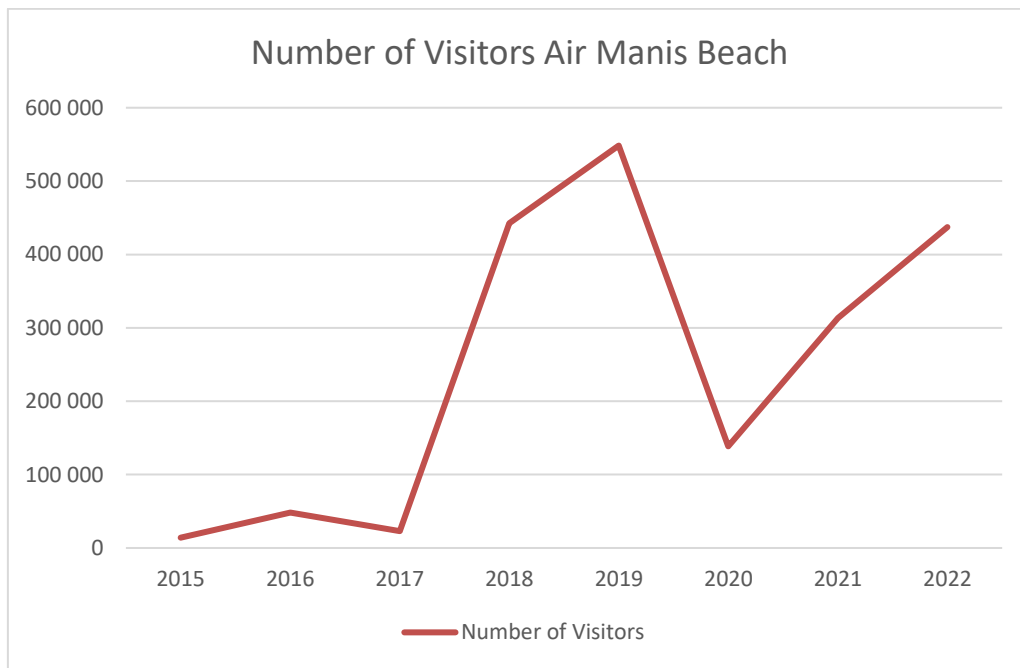


Figure 9. Number of Visitors Air Manis Beach 2015 -2022

4. CONCLUSION

The aesthetic quality of Air Manis Beach has a score in the low category, namely with a score of 2.82 based on the Euclidean graph with an assessment of physical parameters, for sea and land with a score of 3 each. The physical parameters are waves, tides, island groups, beach conditions which is sloping and wide so it is adequate for various tourist activities, one of which is beach recreation. This is the main reason that makes Air Manis Beach attractive for tourism. In general, Air Manis Beach has low aesthetic quality, but has the potential to be developed as a better beach tourism in the future.

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