



Suitability and Carrying Capacity of Recreational Coastal Tourism at Tanjung Bayang Beach, Makassar, Indonesia

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ABSTRACT

Increasing tourism activities at Tanjung Bayang Beach, Makassar, have raised concerns regarding visitor management, environmental degradation, and the absence of recent estimates of tourism carrying capacity to support sustainable coastal management. Although the beach is one of the main coastal recreation destinations in Makassar, quantitative information on its tourism suitability and carrying capacity remains limited. Therefore, this study aimed to evaluate the suitability of Tanjung Bayang Beach for coastal tourism and to estimate the recreational and beach sports carrying capacities using standardized tourism suitability parameters and carrying capacity equations. Field surveys and direct observations were conducted at 3 sampling stations on January 1 to February 28, 2023. Measurements were performed for 3 stations. The assessed parameters included beach width, beach slope, substrate type, water depth, current velocity, water transparency, beach length available for tourism activities, supporting facilities, and the average duration of visitor activities. Secondary information was obtained from relevant government agencies and published literature. Tourism suitability was evaluated using the Tourism Suitability Index (TSI), while the Regional Carrying Capacity (RCC) was estimated using the available tourism area, space requirement per visitor, average length of stay, and operational time for each tourism activity. The analysis showed that the average Tourism Suitability Index was 89.96%, classifying Tanjung Bayang Beach as S1 (Very Suitable) for coastal tourism. The estimated Regional Carrying Capacity was 530 visitors day⁻¹ for recreational beach tourism and 369 visitors day⁻¹ for beach sports. These estimates were derived from [state the effective tourism area (14.040 m²) space requirement per visitor (50 m² person⁻¹), visitor duration (6 hours), and daily operational time (8 hours), following the standardized carrying capacity formula. The results indicate that Tanjung Bayang Beach has high potential for sustainable coastal tourism, provided that visitor numbers are managed within the estimated carrying capacity to minimize environmental impacts and maintain ecosystem quality.

INTRODUCTION

Coastal tourism has experienced rapid growth in Indonesia, generating important economic benefits while simultaneously increasing pressure on coastal ecosystems. Uncontrolled tourism activities can exceed the environmental carrying capacity of coastal areas, resulting in habitat degradation, shoreline erosion, pollution, and declining ecosystem quality. Therefore, sustainable coastal tourism development requires the integration of environmental suitability assessment and tourism carrying capacity analysis to ensure that visitor use remains within ecological limits (**Lathifah & Noorman, 2017; Rina *et al.*, 2021; UNWTO & UNEP, 2021; OECD, 2020; Ministry of Tourism and Creative Economy of the Republic of Indonesia, 2023**).

Tourism activities are starting to lead to environmental and ecological conservation, often referred to as ecotourism in this era of globalization. Thus, it needs to be explored and developed in order to make tourists aware and care about the environment. Ecotourism in an area has many benefits in terms of economy, ecology, and socio-culture (**Budhyana, 2008; Ifah, Hasyim & Dinanti, 2020**).

The Tourism Suitability Index (TSI) is a quantitative method used to evaluate the suitability of a coastal area for specific tourism activities based on its physical, ecological, and environmental characteristics. The TSI integrates multiple environmental parameters into a single index that classifies an area according to its level of suitability for tourism development. This method is particularly appropriate for coastal tourism planning because it provides an objective basis for identifying locations that can support recreational activities while minimizing environmental degradation (**Subandi *et al.*, 2018; Maindo *et al.*, 2019**).

The development of the beach as an ecotourism place is an environmental service from resource allocation that tends to provide benefits to one's inner satisfaction because it contains certain aesthetic values (**Tang & Asmidar, 2016; Tang *et al.*, 2021**). Advances in science and technology have made it easier for tourists to determine their tourist destinations with a responsible natural ecotourism development model in the area they visit. In addition to enjoying the beauty of nature, it also involves elements of education and support for conservation efforts, both directly and indirectly. Ecotourism activities are expected to have a positive impact on environmental sustainability and improve the economy of local communities.

Tanjung Bayang Beach in Makassar City is one of the most popular coastal tourism destinations in South Sulawesi because of its white sandy beach, coastal scenery, and recreational opportunities (**Ilyas, 2009**). The increasing number of visitors has raised concerns regarding the sustainability of tourism activities and the capacity of the coastal ecosystem to accommodate recreational use without environmental degradation. Despite its growing popularity, quantitative information on the environmental suitability of the site for beach tourism and its tourism carrying capacity remains limited, creating challenges

for evidence-based tourism management (Tang & Asmidar., 2016; Tang *et al.*, 2021). Therefore, this study aims to evaluate the Tourism Suitability Index (TSI) of Tanjung Bayang Beach and estimate its tourism carrying capacity as a basis for sustainable coastal tourism management.

MATERIALS AND METHODS

Field surveys were conducted at Tanjung Bayang Beach, Makassar City, South Sulawesi Province, Indonesia, from 1 January to 28 February 2023. Data collection was scheduled during daylight hours under safe field conditions and was carried out during periods of low to moderate tide to ensure consistent access to the intertidal zone and recreational beach area. Surveys were undertaken only when weather and sea conditions were favorable, characterized by the absence of heavy rainfall, strong winds, or high waves that could interfere with field observations and visitor activities. January–February was selected because it coincides with the peak holiday and recreational season at Tanjung Bayang Beach, providing representative information on tourism activities and beach utilization.

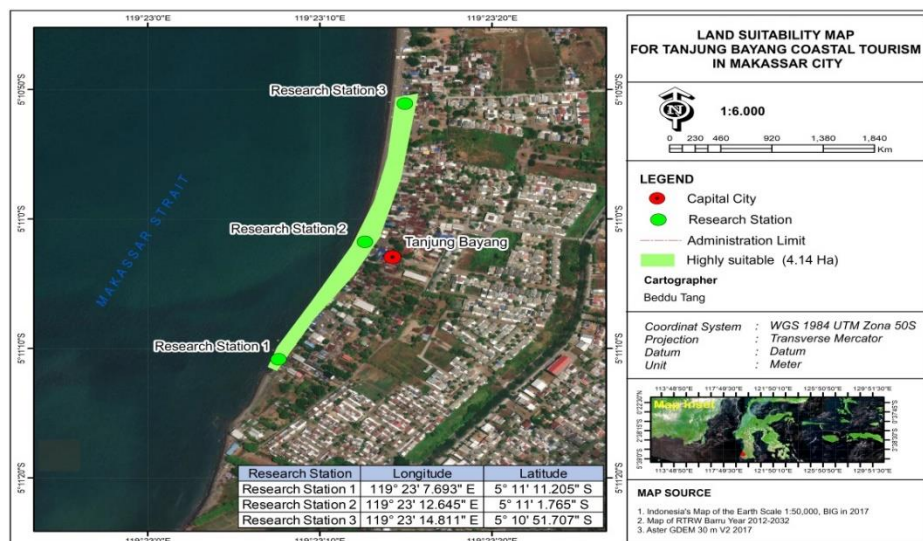


Fig. 1. Research sites.

This study used both primary and secondary data. Primary data were collected directly in the field through structured questionnaires, direct observations, field measurements, and documentation. Secondary data were obtained from relevant government agencies, research institutions, statistical reports, and other published sources related to the physical, environmental, and tourism characteristics of Tanjung Bayang Beach.

The questionnaire survey was conducted between 1 January and 28 February 2023 in the Tanjung Bayang Beach area, Makassar City, South Sulawesi Province, Indonesia.

A total of 99 respondents participated in the survey. Respondents were selected using accidental (on-site) sampling, with the criteria that they were at least 17 years old, were visiting the beach for recreational purposes during the survey period, and were willing to participate voluntarily.

The questionnaire consisted mainly of closed-ended questions with several open-ended questions for additional comments. The survey collected information on visitor characteristics (age, gender, place of origin, and visit frequency), recreational activities undertaken, preferred locations, length of stay, perceptions of environmental conditions, visitor satisfaction, and opinions regarding the acceptable level of crowding and facility availability.

Responses from the questionnaire were used to support the estimation of the Recreation Carrying Capacity (RCC) by providing empirical information on average visitor length of stay and patterns of recreational use. In particular, the average duration of each visit was used to determine the visitor rotation factor (Rf), which represents the number of visitor-use cycles that can occur within the daily operational period. Information on visitor preferences and activity distribution was also used to verify the suitability of the designated recreational area and to interpret the RCC results from a management perspective.

The analysis of the suitability of the area for coastal ecotourism has two categories, namely the suitability of recreational tourism and the category of beach sports (Table 1).

Table 1. Area suitability matrix for coastal tourism recreation category.

Number	Parameter	Weight Value	Class Suitability (Score)					
			S1	Score	S2	Score	N	Score
1	Depth (m)	5	0-3	3	6-3	2	6<	1
2	Beach Type	5	Sand white	3	The white sand is a little rocky	2	Muddy	1
3	Beach Width (m)	5	10<	3	3-10	2	3>	1
4	Water Base Material	4	Sand	3	sandy coral	2	Muddy	1
5	Current Speed (m/s)	4	0-0,17	3	0,17-0,51	2	0,5 <	1

Tourism Suitability at Tanjung Bayang Beach

6	(%) Brightness	3	75%<	3	50-75	2	50 >	1
7	Dangerous Biota	3	There isn't any	3	Pig hair, stingray	2	Pig hair, stingray, lepu	1
8	Freshwater Availability	3	0,5	3	km 1-2<	2	2 km	1

Source: Modification (Yusuf, 2007).

According to Yusuf (2007), the formula used for the suitability of coastal tourism is:

$$TSI = (\sum N_i / N_{\max}) \times 100\%$$

TSI = Tourism Suitability Index

V_i = Parameter value to i (Weight x Score)

$N_{\max}$ = Maximum Value of a Tourism Category

Table 2. Classification of beach tourism suitability assessment for recreation category.

Number	Classification	Score
1	Very Suitable (VS)	% 100 – 81
2	Suitable (S)	% 80 – 63
3	Conditionally Suitable (CS)	% 62 – 44
4	Insuitable (IS)	% 44 >

Source: (Subandi *et al.*, 2018).

Tourism carrying capacity was calculated using the formula (Yulianda, 2010):

$$RCC = EP \times LAU / UAC \times TPA / TSA$$

Description :

RCC = Regional carrying capacity

EP = Ecological potential of visitors per unit area

LAU = area or length of area that can be utilized

UAC = Unit area for a certain category

TPA = Time provided by the area for tourism activities
in one day

TSA = Time spent by visitors for each activity.

Beach recreation activities and beach sports are seen in Table (4). It is assumed that everyone needs a coastline of 50 m², because visitors will carry out various activities that require a large space, such as sunbathing, cycling, walking and others.

Table 3. Visitor ecological potential and area of activity.

Type of Activity	V (Σ Visitor)	Unit Area (Lt)	Description
Beach Recreation	1	50 m ²	1 person per 50 m ² beach length.
Beach Sports	1	50 m ²	1 person per 50 m ² beach length.

Source: (Yusuf, 2007).

Data on ecological potential of visitors and area of activity can be seen in Table (3). Visitor activity time (Tp) is calculated based on the length of time spent by visitors to carry out tourism activities. Visitor time is calculated by the time allotted for the area (Tt) (Table 4). Regional time is the length of time the area is opened in one day, and the average working time is about 8 hours (8-16 hours).

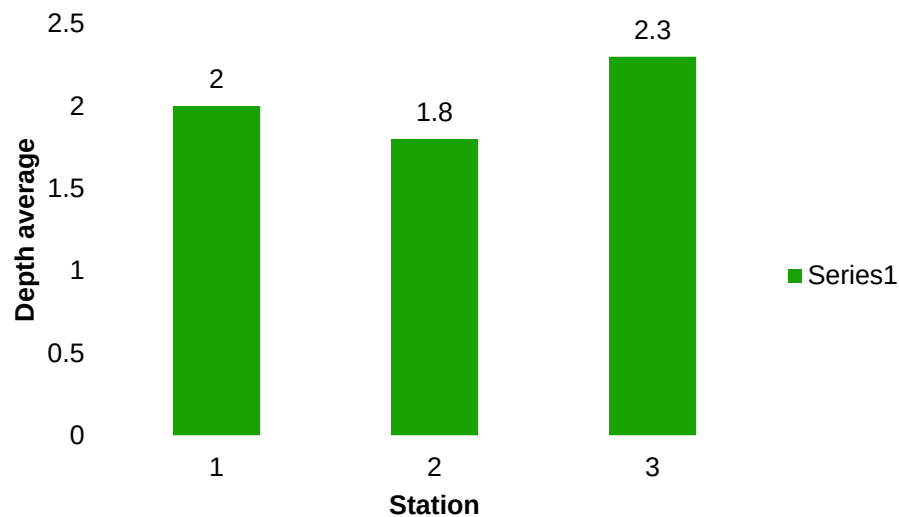
Table 4. Type of activity and time required.

Type of activity	Time required Wp-(hour)	Total time per 1 day Wt-(hour)
Sunbathe	2	4
Beach recreation	3	6

Source: (Yusuf, 2007).

RESULTS

Water Depth

**Fig. 2.** Depth average of Tanjung Bayang coastal waters.

Beach Type

The results showed that at each observation station, the Tanjung Bayang Beach is of a sandy beach type with slightly black and fine sand, each station has the same type, namely slightly black sand.

Beach Width

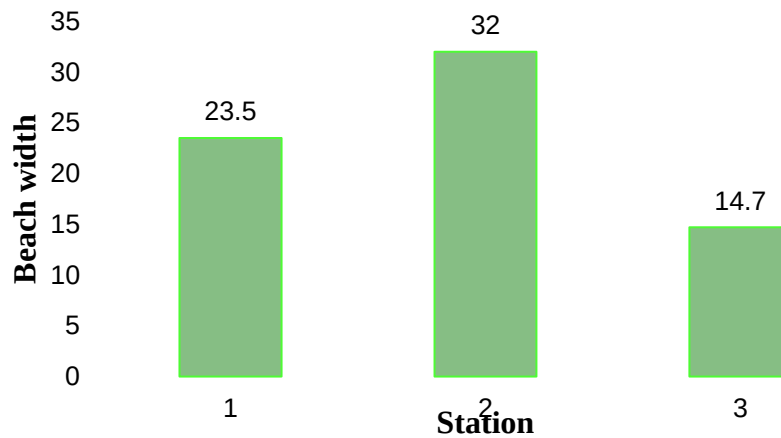


Fig. 3. Beach width of Tanjung Bayang coastal waters.

Water Base Material

Table 5. Beach type observation results at each station.

Station	Base Material	Suitability Category
1	Muddy sand	Suitable
2	Sand	Very Suitable
3	Sand	Very Suitable

Source: Primary data processing results 2023.

Current Speed

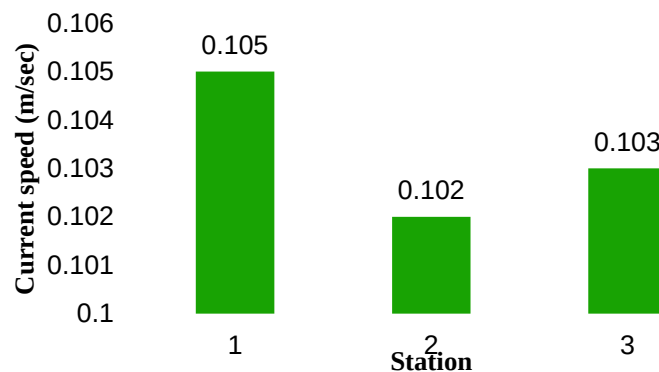


Fig. 4. Tanjung Bayang Beach current speed.

Brightness

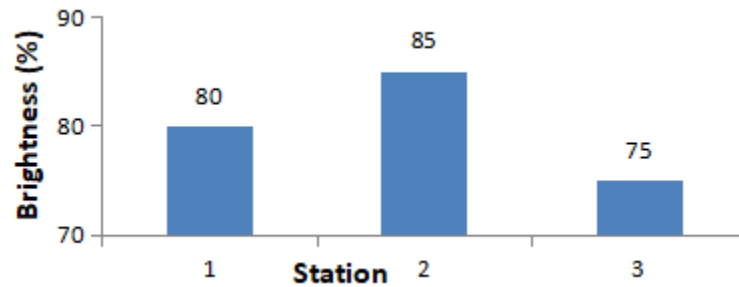


Fig. 5. Brightness of Tanjung Bayang Beach.

Freshwater Availability

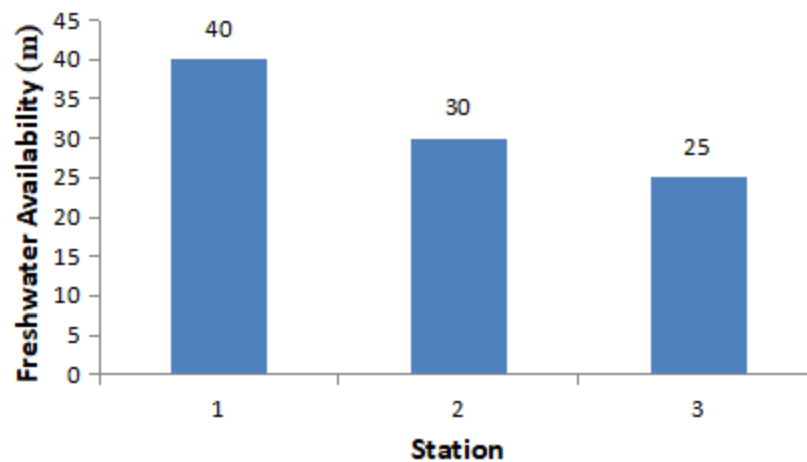


Fig. 6. Freshwater source distance.

Recreational Tourism Area Suitability Index

Table 6. The results of the analysis of the suitability of beach tourism for recreation categories.

Station	IST	Category
1	2,575 / 3 (85.83 %)	S1 (Very suitable)
2	2,823 / 3 (94.1 %)	S1 (Very suitable)
3	2,699 / 3 (89.96 %)	S1 (Very suitable)

Source: Primary data processing results (2023).

Regional Carrying Capacity

Table 8. Carrying capacity of the Tanjung Bayang Beach tourism area.

No	Activity	RCC (person/day)
1	Beach Recreational	530
2	Beach Sport	369

Source: Primary data processing results (2023).

DISCUSSION

Tourism Suitability Index

Factors that can affect the value of the Tourism Suitability Index (IST), namely; water depth, beach type, beach width, water base material, current speed, brightness, dangerous biota and fresh water availability. These factors can be described as follows:

Water Depth

The depth of the waters is an important aspect that is considered in determining an area to be used as beach tourism, especially bathing and swimming because the depth of the shallow waters is good enough to be used as a recreational object for bathing and swimming. Low water depths are less dangerous than deep waters. Tanjung Bayang Beach has a depth between 1,8 – 2,3 meters, the average depth at each observation station can be seen in Fig. (2).

From the results of measurements of waters with an average depth of 2.3 meters, it is obvious that these waters are relatively shallow and good for beach tourism in the recreational category, especially bathing and swimming. A good depth is around 0-3 meters (**Subandi et al., 2018**). Tanjung Bayang Beach has a depth of between 1.8-2.3 meters so it can be said that Tanjung Bayang Beach has a tourism suitability index (S1). In this case, the waters are very safe for beach tourism activities in the recreational category, especially bathing and swimming, this is in accordance with the opinion of **Hazeri (2014)** and the results of research **Yulisa et al. (2016)** and **Subandi et al. (2018)** which provide a depth value limit for suitability for coastal tourism, the category is quite suitable between 1-3 meters.

Beach Type

The results showed that at each observation station the Tanjung Bayang Beach Type is a sandy beach type with slightly black and fine sand, each station has the same type, namely slightly black sand, according to **Yulianda (2007)** for tourism. The beach will be categorized as very good if a beach is a sandy beach or in other words dominated by a sand substrate, compared to a rocky beach or a beach dominated by coral substrate which can disturb the comfort of tourists. Research by **Zen (2015)** and **Ardian and Khodijah (2025)** postulated that the white sandy beach area is good for beach tourism activities such as recreation and sightseeing. The results of the analysis in the field of

sediment grains at each station were dominated by medium size substrate types. Coarse and medium sediment sizes are very good for coastal ecotourism activities compared to very fine and coarse sediment grain sizes (**Hazeri, 2014**). Visual observations in the field at each station elucidated that the beach substrate consists predominantly of sand. According to **Pangesti (2007)** and **Hazeri (2014)**, the type and color of sand in a tourist attraction provides its own value for the aesthetics of the beach itself where beaches that have white sand types and medium to coarse-sized black sand are highly preferred by tourists. According to **Mukhtar *et al.* (2016)** sandy beaches or dominated by sand substrates are very good for beach tourism, compared to rocky and muddy beaches because they can interfere with tourist comfort.

Beach Width

The measurement results at each observation station showed that the width of the beach at station I was 23.5 m, station II was 32 m, and station III was 14.7 m. From the results of the suitability matrix for beach tourism for the recreation category, station I is included in the suitability of S1 (Very suitable). At station II, it is very suitable (S1) and station III is included in the category of conformity to S2 (Suitable) (**Yulianda, 2007**). The width of Tanjung Bayang Beach is depicted in Fig. (3).

Observations indicated that the width and slope of Tanjung Bayang Beach (12–20 m) make it highly suitable for recreational tourism, allowing visitors to engage in activities such as playing on the sand and enjoying the waves. The width of Tanjung Bayang Beach is >10 in the opinion of **Yulianda (2007)** is very suitable (S1) if it is used as a beach tourism in the recreation category. The results of research conducted by **Yulisa *et al.* (2016)** stated that the width of the beach on the Laguna coast of Merpas Village, Kaur Regency between 13.8-15.3 meters is very suitable for beach tourism activities recreation category. Meanwhile, what we found in this study is that the width of the beach is 12-20 meters, so that this kind of beach includes a slightly sloping beach so it is very suitable for recreational activities and beach sports. This is supported by **Yulianda (2007)**, who postulated that a beach with a width of 10 meters is very suitable for beach tourism activities.

Water Base Material

Water base material / substrate is a determinant of the brightness of waters. Observation of water base material / substrate is carried out by making direct observations in the field by looking visually at 3 research stations. Based on the results in the field, it can be seen in Table (4) that the basic material of the water/substrate at Tanjung Bayang Beach Makassar is sand. This is also in accordance with the opinion of **Hazeri (2014)** with the result that the bottom material of the water/substrate in Tanjung Pesona coastal waters is sand. The white water/substrate base material is very suitable for

recreational tourism and swimming. The results of direct observations in the field are also supported by the theory put forward by **Yulianda (2007)** that the white water/substrate base material is very suitable (S1) to support recreational tourism at Tanjung Bayang Beach.

Hazeri (2014) and **Yulisa et al. (2016)** elucidated that the beach with a sand bottom material is very suitable for recreational activities, especially for swimming activities since the water is very clear. Meanwhile, field observations indicated that the substrate of Tanjung Bayang coastal waters consists of mainly sand with slight muddy patches, suggesting that the water on this beach remains within the category of clear sea water making it very suitable for recreational activities. This is consistent with the theory of **Yulianda (2007)** which states that the white water/substrate base material is classified as very suitable (S1) for supporting coastal tourism activities.

Current Speed

Nybakken (1992) has demonstrated that current speed is closely related to tourism safety in swimming. Weak currents are very good for swimming, while very strong currents are dangerous because they can drag people who are bathing or swimming on the beach. The speed of the current is closely related to the comfort and safety of the tourists bathing and swimming. Current velocity data collection is done first to determine the coordinates of 3 stations that have been determined using GPS (**Danial et al., 2021**). The speed of the current at Tanjung Bayang Beach Makassar can be seen in Fig. (6).

Field measurements revealed that the average current velocity at Tanjung Bayang Beach is 0.102 – 0.105 (m/s). This low current speed is ideal for recreational tourism and swimming. According to **Yulianda (2007)** suitability matrix, the beach falls into ‘the very appropriate’ category (S1) for recreational use. These findings are consistent with **Hazeri (2014)** who reported a current velocity of 0.13 m/s at Kaana Beach on Enggano Island, and with **Yulisa et al. (2016)** who recorded a current velocity of 0.101 (m/s) at the Lagoon beach. It can be concluded that the current velocity at Laguna Beach is relatively low and is thus ideal for recreational tourism and swimming. The speed of the current is closely associated with the comfort and attraction of tourists. If the current is strong, visitors should not engage in hazardous activities; however, when the flow is relatively calm, it provides an impression of comfort and safety for tourists undertaking recreational activities.

Brightness

Effendi (2003) has argued that the brightness value is strongly influenced by suspended solids and turbidity, weather conditions, measurement time, and the accuracy of the person taking the measurement. The brightness measurement was carried out using a secchi disk tied with a rope and then lowered slowly into the waters in the observation location until the visual limit of the secchi disk could not be seen, then measured the

length of the rope and recorded the position of data collection. The brightness of Tanjung Bayang Beach in Makassar can be seen in Fig. (7).

Results of measurements in the field that the brightness in the waters of Tanjung Bayang Beach is 75% - 85%, very suitable for beach tourism activities in the recreational category with 85% beach brightness very suitable for beach tourism activities. The brightness of waters is associated with coastal tourism activities and the number of intensive activities performed around the tourist area, providing comfort for tourists while swimming and undertaking recreational activities. The present results match those of **Cahyadinata (2009)** who conducted research on Kaana Beach, Enggano Island, and of **Hazeri (2014)** and **Yulisa *et al.* (2016)**, who recorded that the brightness of the Laguna Beach is 100% 'very suitable' for beach activities. Likewise, at Tanjung Bayang Beach, researchers postulated that the bottom of the waters still seemed to be seen by visual observation.

Dangerous Biota

Observations of dangerous biota need to be carried out to determine the presence or absence of dangerous biota that will disturb tourist visitors. Observations of dangerous biota were carried out based on snorkeling performed around the research station, (**Masita *et al.*, 2013**). The biota that are dangerous for tourist visitors include gastropods, fire corals, sea urchins, sea urchins, jellyfish, anemones and sea snakes.

Direct field observations through snorkeling at the three stations determined that there is no dangerous biota in the Tanjung Bayang Coastal waters of Makassar nor around the beach, therefore this coastal area is safe for tourism. According to **Yulianda (2007)** the beach under study falls within the 'very suitable' category (S1) for recreational activities. However, interviews with guards living around the tourist area of Tanjung Bayang Beach stated that the presence of dangerous biota on Tanjung Bayang Beach depends on the season. Even if there are sea urchins, tourists who visit the coastal beach can see them directly with visual vision due to the brightness of the basic material in coastal waters.

Freshwater Availability

Availability of water is an important thing in life not only for the household sector but also for the tourism sector. The observation of fresh water availability is done by measuring the distance between the research station and the location where the fresh water source is available. Data from field measurements can be seen in Fig. (8).

Field measurements showed that the distance from the recreational beach area to the nearest freshwater source was 40 m at Station 1, 30 m at Station 2, and 25 m at Station 3. These distances indicate that freshwater is readily accessible throughout the Tanjung Bayang Beach tourism area. Based on the beach recreation suitability matrix developed by **Yulianda (2007)**, the freshwater availability parameter was classified as 'highly

suitable' (S1) because the measured distances were within the highest suitability threshold (≤ 500 m). Therefore, the Tanjung Bayang Beach area is considered highly suitable with respect to freshwater availability for recreational beach tourism. The availability of freshwater is an important supporting factor for coastal tourism because it is required for sanitation facilities, visitor services, and other tourism management activities. Consequently, adequate access to freshwater is one of the key criteria used to assess the suitability and priority of beach tourism development (Yulianda, 2007).

Recreational Tourism Area Suitability Index

Field measurements were conducted at 3 sampling stations, and data were analyzed to determine recreational beach tourism suitability using the assessment criteria outlined in Yulianda's (2007) suitability matrix. The results of calculations and measurements in the field with an analysis of the suitability of tourism and the suitability of the beach area for the recreation category can be seen in (Table 7).

Results of the analysis of the suitability index value of the Tanjung Bayang Beach tourist area, Makassar which is presented in Table (6), it shows that the level of suitability of the Tanjung Bayang Beach area as beach tourism is feasible and suitable to be used as a beach tourism object. This has an important value for the guidelines and management of a coastal tourism area. From the results of the analysis of the suitability of tourist sites at the three stations, the Tourism Suitability Index (IST) is obtained with an average value of 89,96% or is in the S1 category with a value of 85.83 - 94.1% (very suitable), the index value obtained is almost the same at the three stations because the distance between the research stations is only + 300 m. Therefore, field parameters measured showed no significant difference among stations under study, a finding which is consistent with the study of Hazeri (2014), who reported that value of the regional suitability index (IST) is 97.4% (very suitable) on the Kaana coast of Enggano Island. This means that the Tanjung Bayang Beach area is very suitable and can be developed for coastal tourism. The results of this study are similar to previous research (Nugraha *et al.*, 2012; Tang & Asmidar, 2016). The area for Beach Recreational Tourism at Pantai Panjang, Bengkulu City falls within the 'very suitable' category (S1) with an average IKW, namely: 86.90% (very suitable) in Ratu Samban District while the area suitability index value (IST) is 82.14% (very suitable) (S1) in Teluk Segara District.

Regional Carrying Capacity

The carrying capacity of tourism is very important to maintain a sustainable environment for the activities of a tourism. The results of the analysis of the carrying capacity of the Tanjung Bayang Beach area can be seen in Table (8).

The Recreation Carrying Capacity (RCC) analysis indicated that the Tanjung Bayang Beach recreational tourism area can accommodate 530 visitors day⁻¹ without exceeding its ecological carrying capacity. This value is higher than those reported for several other coastal tourism destinations in Indonesia, such as Pantai Cermin, where the

RCC was estimated at 260 visitors day⁻¹ (Ramadhan *et al.*, 2014; Insaniah *et al.*, 2020), and other beach tourism areas with an RCC of approximately 240 visitors day⁻¹ (Yulisa *et al.*, 2016; Rina *et al.*, 2021). Visitor survey data collected during the study period showed that the actual number of visitors ranged from 100 to 200 visitors day⁻¹. Thus, the observed visitor numbers represented only 18.9–37.7% of the calculated RCC (530 visitors day⁻¹), indicating that the current level of tourism use remains well below the maximum carrying capacity of the site. Consequently, the existing recreational activities are unlikely to exert excessive pressure on the coastal environment under the observed conditions. Based on the documented visitor counts obtained during the survey period, no sampling day recorded visitor numbers exceeding the RCC. Although visitor numbers generally increase during weekends and public holidays, the available survey data did not indicate that daily visitation exceeded the carrying capacity of 530 visitors day⁻¹. Nevertheless, because the survey was conducted over a limited period, continuous visitor monitoring during peak holiday seasons is recommended to verify whether exceptionally high visitation could approach or exceed the estimated RCC and to support adaptive management of the tourism area

CONCLUSION

The results indicate that Tanjung Bayang Beach is highly suitable (S1) for recreational beach tourism, with an average Tourism Suitability Index (TSI) of 89.96%. Among the three observation stations, Station 2 achieved the highest suitability score of 94.10%, indicating the most favorable environmental conditions for recreational activities. The Recreation Carrying Capacity (RCC) analysis showed that the beach can accommodate 530 visitors day⁻¹ for recreational beach tourism and 369 visitors day⁻¹ for beach sports activities without exceeding the estimated carrying capacity. Therefore, based on both the tourism suitability assessment and carrying capacity analysis, Tanjung Bayang Beach has substantial potential for sustainable coastal tourism development, provided that visitor numbers remain within the calculated carrying capacity limits.

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REFERENCES

- Ali, D.** (2004). *Utilization of Coastal Resource Potential as Tourism Objects and the Welfare Level of Communities Around Tourist Locations: A Case Study in Jepara Kartini Beach Tourism Area*. Postgraduate Program, Diponegoro University, Semarang.
- Ambarwati, R.; Setiawan, F. and Munir, M.** (2021). Suitability analysis of marine tourism assessed from physical parameters, water quality and visitors' perception at Pasir Panjang Beach, Wates Village, Lekok District, Pasuruan, East Java. *Journal Fisheries*, 14(1): 1–10.
- Andarini, F.** (2002). *Study of the Impact of Tourism Development on the Condition of Coral Reef Ecosystems and the Socio-Economic Conditions of Coastal Communities in Nusa Penida, Bali*. M.Sc. Thesis, Postgraduate Program, Bogor Agricultural University, Bogor.
- Ardian; Khodijah and Zen, L.W.** (2015). A study of the suitability of the coastal tourism area in Pasir Panjang Village, Tanjung Siambang, Dompak Island, Tanjung Pinang City. *UMRAH Journal*, 21(5): 36–45.
- Budhyana, I.** (2008). Disbudpar policy in developing tourism areas in West Java. Paper presented at the Seminar on Tourism Development in West Java, UPI, Bandung.
- Dahuri, R.; Rais, J.; Ginting, S.P. and Sitepu, M.J.** (2004). *Integrated Management of Coastal and Ocean Resources*. Pradnya Paramita, Jakarta.
- Danial; Asmidar; Syahrul; Hamsiah and Ningsih, N.W.** (2021). Analysis of coastline changes using remote sensing applications in the Untia Coastal Area, Makassar City, South Sulawesi Province. *AGRIKAN: Journal of Fisheries Agribusiness*, 14(2): 389–395.
- Effendi, H.** (2003). *Study of Water Quality for the Management of Aquatic Resources and Environment*. MSP-IPB, Bogor.
- Hazeri, G.** (2014). *Study of the Suitability of Laguna Beach in Merpas Village, Nasal District, Kaur Regency as a Tourism and Conservation Development Area*. Thesis, Faculty of Agriculture, Bengkulu University, Bengkulu.
- Hismayasari, I.B.** (2003). *Identification of the Potential of Gili Katapang Island as a Supporting Component for the Development of Bentara Indah Beach Tourism in Probolinggo Regency, East Java*. Thesis, Water Resources Management, Bogor Agricultural University, Bogor.
- Ifah, L.A.; Hasyim, A.W. and Dinanti, D.** (2020). Land suitability for tourism development based on ecotourism criteria in Bumiaji District, Batu City. *Planning for Urban Region and Environment*, 9(1): 205–214.

- Ilyas, M.** (2009). *Tourism Development Strategy of the Togean Islands in Tojo Una-Una Regency*. Thesis, Regional Development Planning Study Program, Postgraduate Program, Hasanuddin University, Makassar.
- Insaniah, R.; Ariani, F.; Rosmasita; Yanti, E.S. and Fani.** (2020). Analysis of the suitability and carrying capacity of tourism at Bunga Beach, Batubara Regency, North Sumatra Province. *Enggano Journal*, 5(3): 392–403.
- Kartini, L.U.** (2011). *Strategy for the Development of the Banda Islands Tourism Area*. Thesis, Postgraduate Program, Hasanuddin University, Makassar.
- Lathifah, H. and Noorman, M.S.** (2017). Marine policy in the context of preserving and managing marine natural resources as an effort to realize Indonesia as a world maritime axis. *Legality*, 25(1): 1–12.
- Law of the Republic of Indonesia Number 1.** (2014). *Concerning Amendments to Law Number 27 of 2007 Concerning the Management of Coastal Areas and Small Islands*. Earth Literature, Jakarta.
- Law of the Republic of Indonesia Number 10.** (2009). *Concerning Tourism*. Earth Literacy, Jakarta.
- Maindo, A.S.; Nur, A.I. and Oetama, D.** (2019). Analysis of the carrying capacity of the Walengkabola Beach Tourism Area, Muna Regency, in supporting sustainable tourism. *Journal of Aquatic Resources Management*, 4(2): 103–109.
- Masita, H.K.; Femy, M.S. and Sri, N.H.** (2013). The suitability of sandy beach tourism on Saronde Island, Pondo Islands District, North Gorontalo Regency. <https://docplayer.info/41435625-html>
- Ministry of Tourism and Creative Economy of the Republic of Indonesia.** (2023). *Indonesia Tourism Outlook 2023/2024*. Ministry of Tourism and Creative Economy, Republic of Indonesia.
- Mukhtar, P.D.; RudiYanti, S. and Purwanti, F.** (2016). Tourism suitability analysis at Nyalo Beach, Mandeh Area, Pesisir Selatan Regency, West Sumatra. *Diponegoro Journal of Maquares*, 5(4): 420–426.
- Nugraha, H.P.; Agus, I. and Muhammad, H.** (2012). Study of area suitability and carrying capacity for beach recreation at Panjang Beach, Bengkulu City. *Journal of Marine Research*, 2(2): 130–139.
- Nybakken, J.W.** (1992). *Marine Biology: An Ecological Approach*. Translated by Eidman, M.; Bengen, D.G.; Malikusworo and Sukritiono. PT Gramedia, Jakarta.
- Permana, E.** (2009). *Integration of Coastal Tourism Development and Fishermen's Settlements on the West Coast of South Bengkulu Regency in the Context of Nature Conservation*. Thesis, Postgraduate Program, Institut Teknologi Sepuluh Nopember, Surabaya.
- Pitana, G. and Diarta, I.K.S.** (2009). *Introduction to Tourism Science*. CV Andi Offset, Yogyakarta.

- Pramudji.** (2002). Management of coastal areas in efforts to develop marine tourism. *Oceana*, 27(1): 27–35.
- Ramadhan, S.; Pindi, P. and Zulham, A.H.** (2014). Analysis of suitability and carrying capacity of the Mirror Beach Tourism Area, Serdang Bedagai Regency. Faculty of Agriculture, University of Sumatera Utara, North Sumatra.
- Santoso.** (2009). *Potential and Development of Klayar Beach Tourism Object in Pacitan Regency*. Thesis, Faculty of Letters and Fine Arts, Sebelas Maret University, Surakarta.
- Sofiyani, A.; Hidayat, W.; Winarno, G.D. and Harianto, S.P.** (2019). Analysis of physical, real, and effective carrying capacities for ecotourism on Pisang Island, Pesisir Barat Regency. *Journal Sylva Lestari*, 7(2): 225–234.
- Subandi, I.K.; Dirgayusa, I.G.N.P. and As Syakur, A.R.** (2018). Tourism suitability index at Pasir Putih Beach, Karangasem Regency. *Journal of Marine and Aquatic Sciences*, 4(1): 47–57.
- Tang, B. and Asmidar.** (2016). *Feasibility of Tanjung Bayang Beach Tourism in Terms of Facilities and Infrastructure*. Research Report, Institute for Research and Resource Development, Indonesian Muslim University, Makassar.
- Tang, B.; Harahab, N.; Tjahyono, A. and Musa, M.** (2021). Suitability and carrying capacity of Larearea Island marine tourism in Sembilan Island Area, Sinjai District, South Sulawesi Province, Indonesia. *AACL Bioflux*, 14(4): 2295–2303.
- United Nations Environment Programme and World Tourism Organization.** (2021). *Baseline Report on the Integration of Sustainable Consumption and Production Patterns into Tourism Policies*. UN Environment Programme and World Tourism Organization. <https://www.unep.org/resources/report/baseline-report-integration-sustainable-consumption-and-production-patterns>
- Yulianda, F.** (2007). Marine ecotourism as an alternative utilization of conservation-based coastal resources. Scientific Seminar Paper, Department of Aquatic Resources Management, Faculty of Fisheries and Marine Science, Bogor Agricultural Institute, 21 February 2007.
- Yulianda, F.; Fahrudin, A.; Hutabarat, A.A.; Harteti, S. and Kusharjani, K.H.S.** (2010). *Integrated Coastal and Marine Management in West Java*. Pusdiklat Kehutanan and SECEM-Korea International Cooperation Agency.
- Yulisa, E.N.; Johan, Y. and Hartono, D.** (2016). Analysis of the suitability and carrying capacity of coastal ecotourism in the lagoon beach recreation category, Merpas Village, Kaur Regency. *Enggano Journal*, 1(1): 97–111.
- Yusuf, M.** (2007). Policy for the management of coastal and marine resources in the Karimunjawa National Park Area. *Fisheries Economic Bulletin*, 4(2): 86–98.