

The Area Carrying Capacity of Marine Tourism in Kei Kecil, Southeast Maluku Province of Indonesia

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Submission date: 24-Apr-2022 04:57PM (UTC+0700)

Submission ID: 1818543114

File name: File_7-article_10_maryam_madubun.pdf (509.08K)

Word count: 4898

Character count: 25271

UDC 332

**THE AREA CARRYING CAPACITY OF MARINE TOURISM IN KEI KECIL,
SOUTHEAST MALUKU PROVINCE OF INDONESIA**

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ABSTRACT

Kei islands are located in the eastern part of Indonesia, particularly in Maluku Province, Southeast Maluku District. *Pasir Panjang* beach in *Kei* Language is called *Ngur Bloat*, which is located in the western part of *Kei Kecil* Sub-district in Ngilingof Village. *Pasir Panjang* beach has a vast area of the second softest white sand in the world and it offers majestic underwater scene with amazing coral reef ecosystem. The increasing number of tourist has made this place more crowded. To deal with this problem, proper management system should be applied. This research was conducted to examine the carrying capacity of *Pasir Panjang* Beach Marine tourism. This survey research employed a combination of descriptive qualitative and quantitative approach. The results of this research showed that the carrying capacity of the spot for tourists to enjoy sunset was found at *DDK* or *ACC* of 480 people/day, enjoy the white sand at *DDK* or *ACC* of 240 people/day, and swim in the sea at *DDK* or *ACC* 240 people/day.

KEY WORDS

Carrying capacity, area, marine tourism.

The Indonesian archipelago has great marine and coastal tourism that offers scenic beauty both on the surface and under the sea. Coastal areas can be developed as tourism attractions such as coastal recreation, enjoying coastal scenery, diving, snorkeling, swimming, fishing and so on (Khorriya, U., et al. 2018). However, coastal and marine ecosystems are vulnerable to negative impacts from tourism activities (Yulianda, 2007, Cisneros et al, 2016).

Based on the Act No. 10 of 2009, the term tourism refers to temporary travel activities from a place of origin to certain destination without any intention to settle or make a living but only to have fun, explore curiosity, spend leisure time and other purposes.

Southeast Maluku District is a district in Maluku Province known for its natural potentials in the form of beautiful beaches, marine parks, historic sites, cultural relics and customs. This place is given a nickname "Hidden Heaven", or Heaven of the World, (The Last Paradise on the Earth) or often called "Fantastic Island" and can be developed into a tourist destination that is worth visiting.

The concept of sustainable tourism development aims to meet the needs including economic and recreational needs of the present generation including tourism actors, stakeholders and tourists in the form of economic without threatening the needs of future generations (Arjana, 2015). There are two major aspects that should be put into consideration in the development of tourism business, namely the tolerability of the nature to deal with disturbances or pressure from humans and authenticity standards of natural resources.

The *Kei Kecil* Islands are parts of the Sunda and Banda seas which belong to the Coral Triangle. As a group of islands located in the Northeast of Banda, *Kei Kecil* plays an important role in supporting the sustainability of the world's ecosystems. This statement is not overwhelming because the waters provide food for broader ecosystem and as a Small *Kei* Small Island Park (TPK), the area provides support for Maluku Province as one of the National Fish Barn (Syaputri, 2016).

According to Fachri (2015), the Small *Kei* Islands in Southeast Maluku District have begun to become the new star among other marine tourism destinations in Eastern

Indonesia. The *Kei* Islands were chosen as the object of this research for the unique potentials of natural resources, beautiful scene but less known by Indonesian people. This research shows the beauty of *Kei* that is expected to increase the number of tourist visits to *Kei* Islands.

The area carrying capacity should be a concern in the development of marine tourism regarding the fact that marine areas are not meant to carry great number of tourists as they are easily damaged while the spaces for visitors are very limited. The development of tourism activities in the coastal areas is generally based on economic interest to attract as many tourists as possible without regard to the carrying capacity of the environment.

The carrying capacity of a tourist area is defined as the number of tourists that can be tolerated without giving significant negative impacts for the local community, environment, and economy while providing sustainability guarantees in the future.

For tourists who love marine tourism and underwater diving (diving), surfing, snorkeling, fishing (fishing) with a variety of species, swimming (swimming), sunbathing (sun bathing), beach volleyball and playing kites on the beach, *Pasir Panjang* beach would be a great place to visit.

According to Atana (2018), the ability of an area in serving tourism demand without causing declines in environmental quality is understood as the concept of environmental carrying capacity for tourism. The possibility of deteriorating environmental quality can be prevented by taking into concern the characteristics, potential, and the carrying capacity of a tourism place in serving tourism demands. Moreover, high tourism demand will also be followed by higher demands for adequate tourism facilities.

The concept of *Daya Dukung Kawasan* or Area Carrying Capacity (*DDK OR ACC*) is an important indicator in the management of human activities regarding the availability land (Sari et al., 2015). Conditions that go beyond *DDK* or *ACC* (Over Carrying Capacity) will cause discomforts for the people and bring damages to environmental resources (Muflih, 2015).

According to Wunani (2014), the negative impact of human activities on the sustainability of an ecosystem in tourist locations can be minimized by concerning its carrying capacity. If the condition of a region has exceeded its carrying capacity, deterioration of natural resources in the region will occur, visitor satisfaction will be lower, and many negative impacts on social and economic aspects will also take place.

Regarding to the above explanation, the lack of in-depth observations regarding *Pasir Panjang* beach has intrigued the researcher to conduct this research in order to analyze the carrying capacity (*DDK* or *ACC*) *Pasir Panjang* Beach. *DDK* or *ACC* provides information about the maximum number of visitors that can be accommodated in order to prevent negative impacts for both humans and the environment and to determine the right way to develop the place for tourism destination. This research calculated the carrying capacity based on different recreational activities; swimming in the sea, enjoying white sand and enjoying the sunset. In this research, the *DDK* or *ACC* scores were then compared to the current data on tourism activities in the place to be analyzed further using an approach proposed by Yulianda. This research is expected provide reliable data / information and references in that support the development and management of *Pasir Panjang* beach as a sustainable tourist attraction.

LITERATURE REVIEW

Coastal tourism offers leisure tourism activities and recreational activities that can be carried out in the coastal area and water area including various activities that take place on the beach (enjoying the view and coastal tourism) and tourism in the sea (diving, swimming, and fishing). Hence, that coastal tourism activities are highly influenced by ecosystems and the environment such as sandy beaches, coral reefs, mangroves, and cultural heritage (Hall, 2001).

The carrying capacity of a tourist area is defined as the number of tourist attendance that can bring some impacts on the local community, environment, and economy which

impacts can be tolerated by both the community and the tourists themselves, while at the same time giving guarantees for the sustainability of the environment in the future.

Analysis of the carrying capacity of a region is an attempt that can be done to give limitation to the use of resources in order to avoid environmental damages and damages toward the resources.

Atana, T and J. Purwohandoyo (2018) explained that the ability of a region in serving tourism demand without causing decreases in environmental quality which is understood as the concept of environmental carrying capacity for tourism. High tourism demand will also be followed by higher demands for adequate tourism.

Carrying capacity analysis is a method that can lower the pressure on the environment due to tourist activities (Koroy et al., 2018)

Carrying capacity can be interpreted as the ability of the nature to tolerate external influences without causing damages to the nature. The concept of carrying capacity was developed based on the idea that the environment has the capacity to support an organism's growth (Wahyuni et.al, 2017).

According to Sari et al (2015), the concept of regional carrying capacity is an important indicator in managing human activities and the availability of supporting land. The negative impact of human activities on the sustainability of an ecosystem in tourist sites can be minimized by analyzing its carrying capacity (Wunani, 2013).

Excessive visits in an area can result in environmental damages. Therefore, Nugraha et al (2013) believed that the concept of regional carrying capacity is important in preventing environmental exploitation.

In addition to considering the ecological factors of the tourist area, the carrying capacity of the coastal area includes two important indicators, namely intensive use of the beach for tourism activities and the convenience of tourists in conducting tourism activities (Rajan et al, 2013).

Over Carrying Capacity can lead to discomfort for human and damages to the environment (Muflih, 2015).

According to Ketjulan (2010), regional carrying capacity can be interpreted as the ability of the environment or region to support the lives of humans or other living things.

Yulianda (2007) stated the carrying capacity of tourist areas regards two aspects; the ability of the nature to tolerate disturbances or pressure from humans and the standard of authenticity of the natural resources.

The carrying capacity of the region greatly determines the sustainability of tourism activities of the region. The carrying capacity of each region differs from one another and it is related to the type of tourism activities that will be developed.

The carrying capacity of an area is measured based on the area and time provided per day for tourism activities. Measuring the carrying capacity of a tourist area reminds human that the nature has a space limit in accommodating the presence of tourists

The carrying capacity of the tourism area referred to in this study is the ability of the Pasir Panjang beach area (Ngurbloat) in tolerating certain number of tourist visit and maximum level of natural resource utilization without damaging the environment.

The carrying capacity of an area should be physically, environmentally and socially analyzed. However, this research only regarded the carrying capacity of a tourism area related to the number of tourist visit, the tourism activities carried out in the area, and the facilities available. The need for space determines the size of facilities that should be built cope with higher tourist visit.

METHODS OF RESEARCH

This research was carried out at *Pasir Panjang* beach, Ngilingof village, West *Kei Kecil* Sub-district, Southeast Maluku District. The collection of research data was administered from March 5 to April 2, 2018 once a week. The observation area is limited to the area between the last vegetation area on the coast and the highest tide limit for measuring the width of the beach while the measurement of the length of the beach was done by measuring

the horizontal coastline between beaches or landscapes that limit them (Yulisa et al., 2016). A more detail location of this research is presented in Figure 1.



Figure 1 - Research Location

Several research instruments were employed in this research including a set of questionnaires to collect data from respondents, roll meters to measure the length and width of the beach, GPS to determine the sampling point, and camera for documentation. In addition, in this research, secondary data in the form of the number of tourist visits to *Pasir Panjang* beach were also used as research materials.

The primary data of this research were directly collected while for the secondary data were obtained indirectly. Primary data were collected through observation, questionnaires, documentation and direct interviews on the field. Secondary data were obtained from Bappeda report, BPS, Tourism Office, Fisheries Service and from the results of related research.

Research data were collected using questionnaires, stationery, documentation and records from previous researchers. The data related to the development of marine tourism in *Pasir Panjang* Beach, *Kei Kecil* Islands were provided from respondents including local community, visitors, tourism agents, and the government involved in the management of marine tourism in *Pasir Panjang* Beach, *Kei Kecil* Islands.

This research regarded primary data and secondary data. Primary data were directly obtained from surveys done to the research location including observation and direct interview to research respondents based on the questionnaire. The respondents were the visitors of *Pasir Panjang* beach. Whereas, secondary data were in the form of reports released by related institutions such as *Bappeda*, *BPS*, Tourism Department, Fishery Department, and results of other relevant research.

Interviews were done to obtain deep information about the research location. Interviews were conducted to 94 respondents who were selected using the purposive sampling technique. Meanwhile, 64 visitors were interviewed based on different recreational activities they did; enjoying sunset, enjoying white sand and swimming in the sea. Field observations were carried out to collect primary data through observation and measurement of the required environmental parameters including the length and width of the beach.

The following formula was used to calculate the carrying capacity of research location based on the concept of carrying capacity proposed by Yulianda (2007):

$$DDK \text{ or } ACC = Kx (Lp/Lt) x (Wt/Wp)$$

Where: *DDK* or *ACC*: Area Carrying Capacity (people); *K*: Ecological visitor potential per unit area (people); *Lp*: Total area (m²) or length of the area that can be used; *Lt*: Unit area for certain category (m² or m); *Wt*: Available time duration for recreational activities per day (hour); *Wp*: Time spent for certain activity (hour); Yulianda (2007) stated that ecological potential of the visitor is determined by the condition of the area and the types of activities done in the area.

Table 1 – Visitor Ecological Potentials (K) and Total Area for Recreational Activities (Lt)

Type of Activity	K (Σ Visitor)	Unit Area (Lt)	Note
Swimming in the Sea	1	50 m	1 person every 50 m
Enjoying the White Sand	1	50 m	1 person every 50 m
Enjoying the Sunset	1	50 m	1 person every 50 m

Carrying Capacity of an area is adjusted to the characteristics of the available resources and designation. Human's need for space is assumed as horizontal space for a person to be able to move freely without feeling disturbed by other visitors. In the context of beach tourism activities, a visitor is assumed to need at least 50 meters coastline to do various activities such as enjoying the sunset, enjoying white sand, swimming in the sea, cycling, walking, etc. (Artadana, 2018)

The duration of activity (*Wp*) is calculated based on the length of time visitors spend on doing certain recreational activities. The duration is calculated by measuring the total time available (*Wt*) (Table 2). *Pasir Panjang* beach is opened for around 10 hours (10-18 hours).

Table 2 – Predicted Duration for Each Recreational Activity (Yulianda, 2007)

Activity	Required Time Wp (Hour)	Total Time per Day Wt (hour)
Swimming	2	4
Surfing	2	4
Sunbathing	2	4
Recreational Activities at Beach	3	6
Beach Sport	2	4

Table 3 – Predicted Duration for Each Recreational Activity in *Pantai Pasir Panjang*

Activity	Required Duration Wp (Hour)	Total Time per Day Wt (hour)
Swimming in the Sea	2	8
Enjoying the White Sand	2	8
Enjoying the Sunset	1	8

RESULTS AND DISCUSSION

Carrying capacity can be interpreted as the ability of the nature to tolerate human activities without causing damages to the nature. The concept of carrying capacity is based on the idea that the environment has the maximum capacity to support the growth of an organism (Wahyuni et al., 2017). Carrying capacity analysis (*DDK OR ACC*) is a method that can be used to minimize the pressure and damages in the environment due to tourism activities (Koroy et al., 2018). The carrying capacity of the *Pasir Panjang* beach area was measured by considering the amount of ecological potential of visitors, the area included in the category and the time required for a visitor to do certain activity.

Based on the results of interviews as presented in Table 4, out of 64 visiting visitors, most of them need 2 hours for swimming in the sea (16%) and 2 hours (16%) for enjoying the white sand and an hour (32%) to enjoy the sunset.

The unit area, the duration to do various activities and the total time available per day for tourism activities greatly influence the comfort of tourists in enjoying their activities. *DDK* of tourism according to Yulianda (2007) can be measured based on the time and area available for tourism activities which are different for each beach as they depend on specific situation and conditions of an area.

Table 4 – The Percentage of the Number of Respondents based on Recreational Activities in *Pasir Panjang Beach*

No	Activity	Percentage (%)
1.	Swimming in the Sea	16
2.	Enjoying the White Sand	16
3.	Enjoying the Sunset	32

Excessive visit in an area can result in environmental damages. As pointed out by Nugraha et al. (2013), the concept of *DDK* or *ACC* is needed to prevent environmental damage or degradation and prevent over-utilization of an area. Besides concerning for ecological factors, *DDK* or *ACC* in coastal tourism also considers important indicators, namely intensive use of the beach for tourism activities and the convenience of tourists in conducting tourism activities (Rajan et al., 2013)

In *Pasir Panjang* beach, measurement was administered based on the approach proposed by Yulianda (2007) which results were then compared to the carrying capacity of the area.

Table 5 – The Potential of Carrying Capacity of *Pasir Panjang Beach*

Activity	K	Lp	Lt	Wt	Wp	DDK OR ACC
Swimming in the Sea	1	3000m ²	50	8	2	240 people/day
Enjoying the White Sand	1	3000m ²	50	8	2	240 people/day
Enjoying the Sunset	1	3000m ²	50	8	1	480 people/day

Table 5 presents the activities done by visitors in *Pasir Panjang Beach* including swimming in the sea, enjoying white sand and enjoying the sunset. In order to be able to carry out these activities comfortably, a visitor needs at least an area of 50 m², with an area of 3000 m². A tourist also needs 2 hours to swim in the sea, 2 hours to enjoy White Sand, and 1 hour to enjoy sunset for 1 hour. While the total time provided by the manager of the *Pasir Panjang Beach* tourist area is around 8 hours. From this description, the carrying capacity of the *Pasir Panjang Beach* area for swimming activities in the sea is 240 people / day, enjoying white sand is 240 people/ day, 480 people/day to enjoy the sunset. Therefore, the overall the carrying capacity of the area for tourists to do those activities is 960 person, or 28,800 people per month or 345,600 people per year.

Based on the primary data on the total visits every month during 2016 at *Pasir Panjang* beach, it can be seen that there were several months of high season in July, August, September and October (Table 6) as there were quite a lot of holidays and in the preparation for the National Level Tourism activity was held and the first *Pesona Meti Kei Festival* (FPMK) in Southeast Maluku Regency where the peak event was also held at *Pasir Panjang Beach* in October 2016.

Table 6 – *DDK* or *ACC* based on Primary Data and Total Visit to *Pasir Panjang Beach* in 2016

Month	Total Visit (Person)	DDK or ACC/Month (person)	Percentage	Note
(a)	(b)	(c)	(d=b/cx100%)	
January	3.537	28.800	12.4	ucc
February	3.659	28.800	12.7	ucc
March	3.775	28.800	13.10	ucc
April	3.808	28.800	13.2	ucc
May	3.833	28.800	13.3	ucc
June	3.857	28.800	13.39	ucc
July	4.395	28.800	15.26	ucc
August	4.464	28.800	15.5	ucc
September	4.683	28.800	16.26	ucc
Oktober	5.000	28.800	17.36	ucc
November	3.143	28.800	10.9	ucc
December	3.162	28.800	10.98	ucc
1 Year	47.316	345.600	13.69	ucc

The total tourist visits per month in 2016 was compared to DDK or ACC based on the primary data approach assuming that the DDK or ACC per day was stayed constant all days within one year. The highest tourist visit occurred in July, August, September and October which numbers did not exceed the DDK or ACC (under carrying capacity) with an average percentage of 13.69% in 2016.

The results of this comparison goes in accordance with Artadana et al. (2018) who also applied similar calculation method as shown in Table 6, in which carrying capacity of Geger Bali beach could accommodate as many as 529 tourists per day, 16.385 people per month and 196.620 people per year. The highest tourist visit occurred in January, July, August and December with a percentage of 39.99% and has fulfilled the DDK or ACC (under carrying capacity).

According to Yulianda (2007), primary data on visits to Pasir Panjang beach show that the DDK or ACC obtained was 480 people per day, or 14,400 people per month or 172,800 people per year. The DDK or ACC obtained in this research is smaller compared to one based on the primary data approach and the tourism activities, where the percentage obtained is 15.89% in a year and fulfils the DDK or ACC (under carrying capacity).

The results of this comparison contradicts the results of a research conducted Artadana et al. (2018) who also used the DDK or ACC approach proposed by Yulianda, in which they found DDK or ACC of 6.231 per month and 74.772 per year and a percentage of 105.16% in a year which could not meet the DDK or ACC (over carrying capacity). The results of this study show that the highest tourist visits occurred in high season in January, July, August, and December in which the number of tourist visit exceeded the carrying capacity (over carrying capacity).

The threat of deteriorating environmental quality can be prevented by taking into consideration the characteristics, potential, and capacity of an area in fulfilling tourism demands. High tourism demand will be followed by demands for adequate tourism facilities.

The white sand of Pasir Panjang beach attracts many tourists to visit this place. According to Yulisa et al. (2016), white sand beaches offer beautiful sceneries and comfort tourists to carry out recreational activities such as swimming, sunbathing, beach recreation and beach sports.

According to Ardianti (2017), the high season in Bali refers to the high visits that occur in particular months as tourism activities get more intensive. High season usually occurs during long holiday season and summer (in 4-season countries). Whereas, low season is where the number of visits is very little in certain months as visitors do not do much tourism activities.

Table 7 – DDK or ACC Based on an Approach Proposed by Yulianda (2007) Compared to Total Number of Visit to *Pasir Panjang* Beach in 2016

Month	Total Visit (Person)	DDK or ACC /Month (person)	Percentage	Note
(a)	(b)	(c)	(d=b/cx100%)	
January	3.537	14.400	32.75	ucc
February	3.659	14.400	33.87	ucc
March	3.775	14.400	34.95	ucc
April	3.808	14.400	35.25	ucc
May	3.833	14.400	35.49	ucc
June	3.857	14.400	35.71	ucc
July	4.395	14.400	40.69	ucc
August	4.464	14.400	41.33	ucc
September	4.683	14.400	43.36	ucc
Oktober	5.000	14.400	46.29	ucc
November	3.143	14.400	29.10	ucc
December	3.162	14.400	29.27	ucc
1 Year	47.316	172.800	15.89	ucc

Differences were found when calculating the *DDK* or *ACC* based on primary data obtained from research questionnaire and the *DDK* or *ACC* calculated based on Yulianda's (2007) approach. The differences occurred due to different parameters used in those calculations (Artadana et al. 2018). *DDK* or *ACC* calculation based on primary data considers the convenience of tourists in carrying out tourism activities, while the one of Yulianda (2007) emphasizes the spaces required to prevent environmental damages and to maintain the natural balance of an area.

It is normal that differences occur related to *DDK* or *ACC* conditions among different beaches. The differences are also influenced by total area, the area needed for tourism activities, the total time provided by the area for tourism activities and the time needed by tourists to do tourism activities. Therefore, *Lt* and *Wp* cannot be directly equated to determine the *DDK* or *ACC* of different beaches since it is influenced by the primary data that represents the condition of a particular area. Therefore, it is necessary to conduct similar research to other areas in order to obtain ideal *Lt* and *Wp* values. Future researchers are also encouraged to extend this research considering the fact that the spaces used for tourism activities in *Pasir Panjang* beach is very large.

CONCLUSION

Based on the primary data, the *DDK* or *ACC* was obtained at 960 people per day or 28.800 people per month and 345.600 people per year. The carrying capacity illustrates the capability of *Pasir Panjang* beach compared to the standards proposed by Yulianda 2007, in which the number of visits to the place was considered low. The results of this research conclude based on the modified *Wp* and *Lt* values based on primary data, the carrying capacity is considered under carrying capacity for 2016.

Further research on *DDK* or *ACC* are necessary to conduct to *Pasir Panjang* beach and other beaches in *Kei Kecil* Islands in Southeast Maluku by taking into consideration the factors that inhibit tourist visits. Those factors include various agendas related to religion-related holiday, annual FPMK activities, and extreme weather. The involvement of those factors in future research is necessary to obtain real *DDK* or *ACC* value that precisely reflects the real condition of an area.

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