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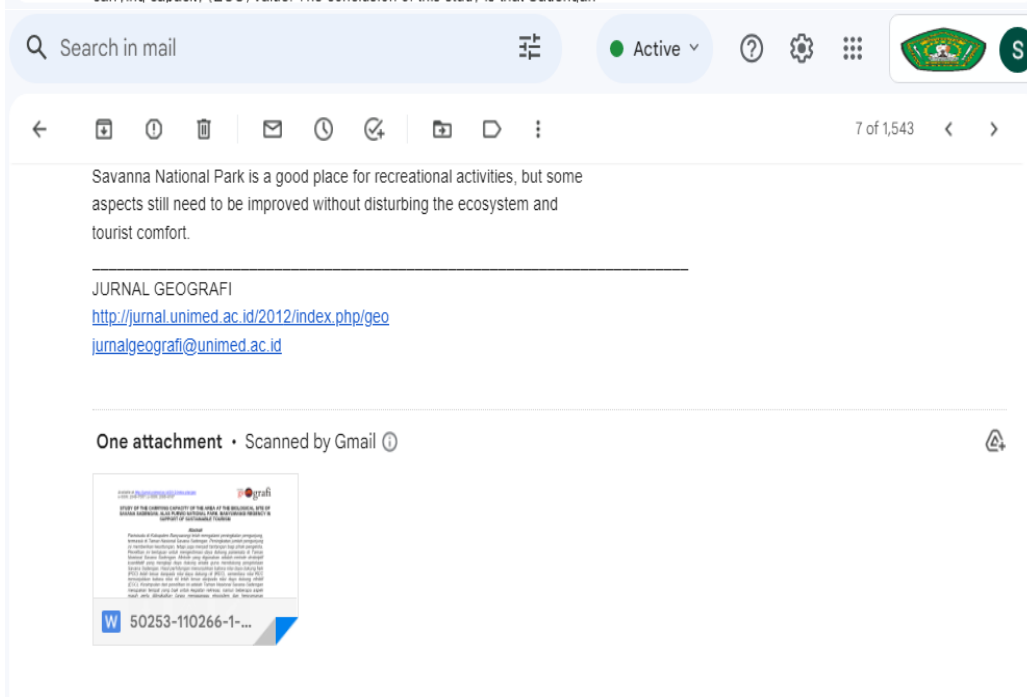
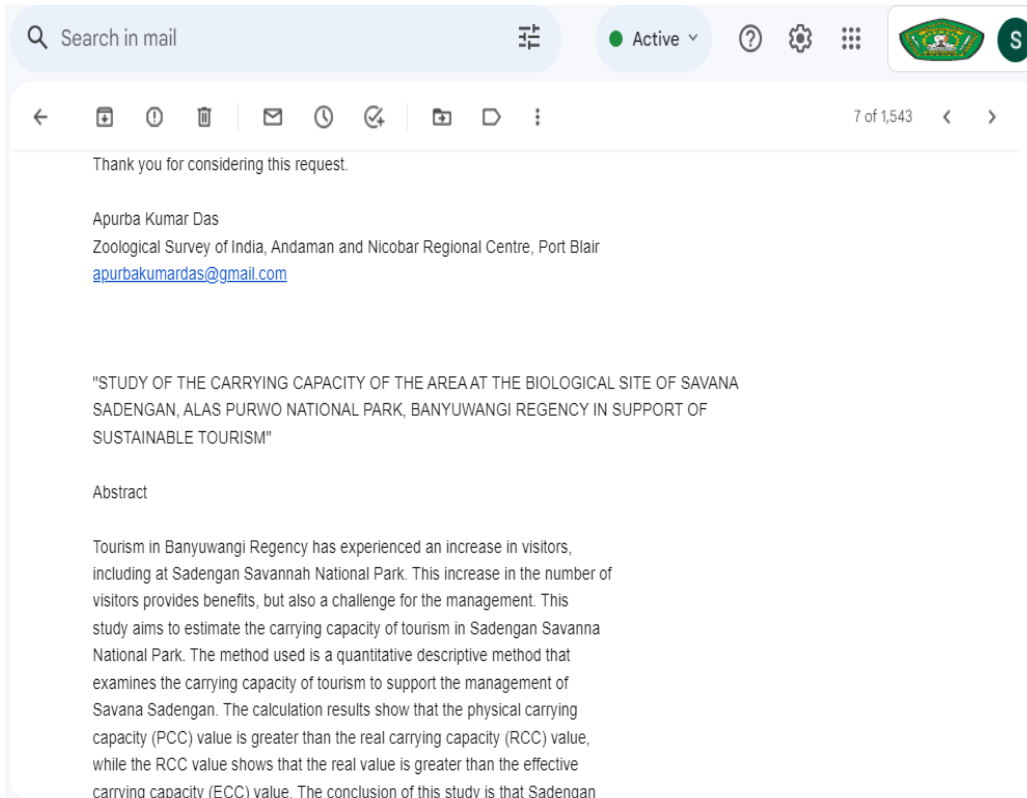
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Journal Section: Articles

Abstract: *Tourism in Banyuwangi Regency has experienced an increase in visitors, including at Sadengan Savannah National Park. This increase in the number of visitors provides benefits, but also a challenge for the management. This study aims to estimate the carrying capacity of tourism in Sadengan Savanna National Park. The method used is a quantitative descriptive method that examines the carrying capacity of tourism to support the management of Savana Sadengan. The calculation results show that the physical carrying capacity (PCC) value is greater than the real carrying capacity (RCC) value, while the RCC value shows that the real value is greater than the effective carrying capacity (ECC) value. The conclusion of this study is that Sadengan Savanna National Park is a good place for recreational activities, but some aspects still need to be improved without disturbing the ecosystem and tourist comfort.*

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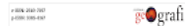
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Apurba Kumar Das
Zoological Survey of India, Andaman and Nicobar Regional Centre, Port Blair
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STUDY OF THE CARRYING CAPACITY OF THE AREA AT THE BIOLOGICAL SITE OF SAVANA SADENGAN, ALAS PURWO NATIONAL PARK, BANYUWANGI REGENCY IN SUPPORT OF SUSTAINABLE TOURISM

Abstrak

Pariwisata di Kabupaten Banyuwangi telah mengalami peningkatan pengunjung, termasuk di Taman Nasional Savana Sadengan. Peningkatan jumlah pengunjung ini memberikan keuntungan, tetapi juga menjadi tantangan bagi pihak pengelola. Penelitian ini bertujuan untuk mengestimasi daya dukung pariwisata di Taman Nasional Savana Sadengan. Metode yang digunakan adalah metode deskriptif kuantitatif yang mengkaji daya dukung wisata guna mendukung pengelolaan Savana Sadengan. Hasil perhitungan menunjukkan bahwa nilai daya dukung fisik (PCC) lebih besar daripada nilai daya dukung riil (RCC), sementara nilai RCC menunjukkan bahwa nilai riil lebih besar daripada nilai daya dukung efektif (ECC). Kesimpulan dari penelitian ini adalah Taman Nasional Savana Sadengan merupakan tempat yang baik untuk kegiatan rekreasi, namun beberapa aspek masih perlu ditingkatkan tanpa mengganggu ekosistem dan kenyamanan wisatawan.

Kata kunci: *Daya Dukung Wisata; Taman Nasional; Savana Sadengan*

Abstract

Tourism in Banyuwangi Regency has experienced an increase in visitors, including at Sadengan Savannah National Park. This increase in the number of visitors provides benefits, but also a challenge for the management. This study aims to estimate the carrying capacity of tourism in Sadengan Savanna National Park. The method used is a quantitative descriptive method that examines the carrying capacity of tourism to support the management of Savana Sadengan. The calculation results show that the physical carrying capacity (PCC) value is greater than the real carrying capacity (RCC) value, while the RCC value shows that the real value is greater than the effective carrying capacity (ECC) value. The conclusion of this study is that Sadengan Savanna National Park is a good place for recreational activities, but some aspects still need to be improved without disturbing the ecosystem and tourist comfort.

Key words: *Carrying Capacity, National Park, Savana Sadengan*

INTRODUCTION

Tourism involves a range of activities and service provision that includes tourist attractions, transportation, accommodation, and various other services. The purpose of all of these is to fulfill the travel needs of individuals or groups. On such trips, they leave their place of residence temporarily for the purpose of rest, business, or for other purposes. (Sugiama, 2011). The primary purpose of the tourism industry is to cater to travelers, and its success relies on the harmonious collaboration of all sectors. The aspiration is that this collaboration among tourism service providers will lead to a favorable and satisfying experience for each individual tourist (Camilleri, 2018).

East Java Province is one of the most frequently visited tourist destinations by tourists, with a total of 155.49 million trips or around 25.79% of the total tourist visits. (Badan Pusat Statistik, 2022). The high number of visitors coming to East Java shows the attractiveness of tourism in the province for local and international tourists. Banyuwangi Regency is one of the areas that is very popular with tourists. After travel restrictions due to the COVID-19 pandemic were relaxed, foreign tourist visits increased by 50 percent. In 2021, only 652 visits from foreign tourists were recorded, but by the end of 2022 the number of foreign tourists increased to 34,470 (Badan Pusat Statistik, 2022).

The COVID-19 pandemic is set to significantly change travelers' interests. It is estimated that, in the future, tourists will prioritize safety and health aspects in traveling. This change in behavior must be anticipated by all stakeholders in the tourism industry (Elistia, 2020). To prepare for the opening of the tourism sector during the adaptation period of the new normal, the Banyuwangi Regency Government has conducted a series of simulations and various preparations.

Banyuwangi Regency has become one of the locations experiencing the development of Geoparks, also known as earth parks. A Geopark is a designated

national protected area that comprises various fascinating geological heritage sites. The concept of Geopark development encompasses the principles of conservation, education, and local economic advancement. Geoparks, also known as Earth Parks, encompass individual or combined geographical regions housing Geoheritage Sites (Geosites) and valuable natural landscapes, embracing factors of Geoheritage, Geodiversity, Biodiversity, and Cultural Diversity. These Geoparks are managed with the aim of preserving the environment, promoting education, and fostering sustainable community economic growth, encouraging active involvement from local communities and governments. As a result, Geoparks play a significant role in raising people's awareness and concern for the Earth and its environment (Presidential Regulation of the Republic of Indonesia Number 9 of 2019 concerning Earth Park/Geopark Development).

One of the biosites that is a tourist attraction in Ijen Geopark is Savana Sadengan. This area is included in the Alas Purwo National Park. Savana Sadengan is an artificial savanna as a feeding ground in Alas Purwo National Park with an area of ±84 Ha. Sadengan area is often said to be similar to the African Savannah. Geologically coastal alluvial plains whose distribution is limited by the ridge of limestone hills compose Sadengan savanna located in the western Alas Purwo National Park. Alas Purwo is a flora and fauna conservation area. The creation of a feeding ground in Sadengan Savanna aims to provide habitat for large mammals including Banteng (*Bos javanicus*), Kijang (*Muntiacus muntjak*), Deer (*Cervus timorensis*), Wild Boar, Ajag and various bird species such as Green Peacock (*Pavo muticus*) and Starling (Geopark Ijen Jatimprov, 2018).

Tourism carrying capacity pertains to the maximum number of tourists allowed to visit a destination concurrently, ensuring that it does not lead to any harm to the physical, economic, socio-cultural environment, and the quality of the

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1. Prioritize the author's view of what is the main attraction of the Sadengan Savana National Park, what is the description of the current carrying capacity status
2. Carrying capacity of the relationship between the main food (flora) as the basic (main) chain for animals (fauna) currently and in the future (devisit/surplus/balance) as part of the Alas Purwo National Park. This is the basis for the sustainability of the Sadengan Savana National Park.
3. Provide an overview of the existing facilities to support the safety and comfort of visiting tourists.
4. Provide data for at least 3 years before Covid, during Covid and post Covid until now the number of tourist visits to the Sadengan Savana National Park. This data is an illustration of the 'recovery and revival' of the Sadengan Savana National Park tourist attraction. So it is necessary to study its carrying capacity in relation to the number of tourist visits that can be accommodated.

experience that could adversely affect tourist satisfaction. It focuses on maintaining a balance between promoting tourism and preserving the integrity of the destination (Siswanto, et al., 2012). In managing complex tourism activities, it is important to ensure that the carrying capacity of the tourist attractions does not exceed the prescribed limits (Maulidatur, et al., 2022). If the focus is only on economic benefits without considering the existing environmental capacity, the increasing number of visits in the tourism sector may jeopardize the sustainability of the resource. Therefore, management that ensures sustainable utilization is required (Pangestu, 2016).

The magnitude of development opportunities is proportional to the obstacles that the tourism sector will face, currently focusing on tourism that is safe from natural and man-made disasters as well as internal and external pressures (Ahsani, et al., 2022). Nevertheless, it is crucial to consider the biophysical aspects of the environment when safeguarding and conserving tourist destinations. The rise in tourist numbers beyond the area's capacity stands as one of the contributors to environmental harm or degradation in the realm of tourism. This concern is particularly pertinent in natural tourist spots, as they are highly susceptible to adverse effects on the surrounding environment (Nayak, et al., 2018). Environmental conditions need to be observed due to disturbances in the environmental value of tourist areas that will affect tourism activities. Activities in nature tourism sites will create a reciprocal relationship between tourism actors (tourists, managers and local communities) and their ecosystems (Siswanto, et al., 2012). The carrying capacity of the tourist environment is often a major problem with environmental damage. The increasing number of tourists who visit results in small problems popping up. Starting from environmental damage due to the influx of tourists who arrive. Tourist areas have a certain ability to accommodate tourists

(Husaini, et al., 2018). Environmental carrying capacity is the ability of an area or region to accept the state of visitation in the number of tourists per unit area per unit time (Swiader, et al., 2020).

Carrying capacity is a fundamental concept in natural resource management that refers to the limit of use of an area that is influenced by various natural factors that affect the durability of the environment, such as the availability of food, shelter, or water (Silvitiani, et al., 2018). The purpose of developing this concept is to reduce or avoid damage to natural resources and the environment, so as to enable the achievement of optimal natural resource management, both quantitatively and qualitatively, which is also sustainable (Utina, 2015). The concept of sustainable tourism development aims to meet the economic and pleasure needs of current tourism operators, stakeholders, and tourists without compromising the needs of future generations (Arjana, 2015). The purpose of the research is to identify the Area Support Capacity of the Sadengan Savannah biological site.

RESEARCH METHODS

Biological sites are areas or locations that have high biodiversity, including unique flora, fauna, and ecosystems. (Dupuis, et al., 2023). Savana Sadengan is one of the biodiversity areas (Biological site) in Geopark Ijen. In addition, Sadengan Savanna is also located in the Alas Purwo National Park area. This research was conducted in Alas Purwo Savana Sadengan National Park. The total area of Sadengan Savanna reaches 84 hectares.

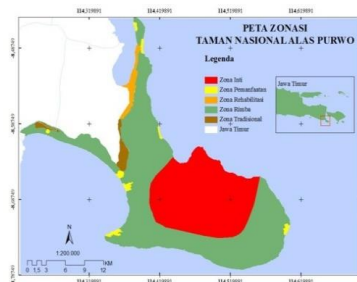


Figure 1. Zoning Map of Alas Purwo National Park
 Source: Information Book of Alas Purwo National Park (2017)

The area used for tourism does not reach 1 hectare. Based on Figure 1. Zoning Map of Alas Purwo National Park only 15% is used as a tourist area in the Sadengan Savannah area. In this study using quantitative descriptive method. Descriptive method is a method that describes a situation or event in the area that is the object of research study. This study also uses quantitative analysis, namely the assessment of the carrying capacity of tourism in Savana Sadengan. The subjects in this study were the managers and visitors of the Sadengan Savannah National Park.

The data collection techniques collected in this study used a primary survey where data collection was carried out by conducting direct field observations and conducting interviews and observations with managers and visitors. Secondary surveys such as literature studies and agency data are also carried out in collecting data to support the results of data in the study. Technical data analysis in this study analyzed the carrying capacity of tourism with the Cifuentes method. The framework for assessing the environmental carrying capacity of tourist attraction zones is designed to establish the optimal visitation limit that a tourist area can sustain, taking into account the physical, biological, and organizational conditions in the study area. This comprehensive approach encompasses three levels of focus: Physical Supportability (PCC), Real Supportability (RCC), and Effective Supportability (ECC). By considering these factors, the framework aims to strike a balance between promoting tourism and preserving the ecological integrity of the tourist destination (Insani, et al., 2020). The description of the data analysis techniques used include:

Physical Carrying Capacity / PCC

Physical carrying capacity is the maximum number of visitors that can be physically accommodated within a given area and period. The available area is limited by several factors including the size of the area, the area required for a particular activity, and the rotation factor (Sofiyani, et al., 2019). The formula used in calculating the carrying capacity of the tourist environment based on the method Cifuentes modified result with research Douglass as follows:

$$PCC = \frac{A}{Au} \times Rf$$

Keterangan:

- PCC : Physical Carrying Capacity
- A : The area used for tourism
- Au : Area required for specific activities (m²)
- Rf : Rotation factor

The formula for calculating the rotation factor is:

$$Rf = \frac{\text{length of time the attraction is open}}{\text{average duration of tourist visits}}$$

Real Carrying Capacity / RCC (Daya Dukung Riil)

RCC, or the Recommended Carrying Capacity, denotes the highest permissible number of visitors allowed in a particular tourist area, determined through adjustments considering the local biophysical characteristics. PCC, on the other hand, stands for Physical Carrying Capacity. In addition, there are correction factors, denoted as Cf to Cfn, which are used to account for the biophysical parameters of the tourist area environment. These correction factors are used in calculating Cfn, and the formula used for such calculations is (Zacarias, et al., 2011)

$$RCC = PCC \times (Cf1 \times Cf2 \times Cf3 \times \dots Cfn)$$

Keterangan:

- RCC : Real Carrying Capacity
- PCC : Physical Carrying Capacity
- Cf1 : Correction Factor

Cfn is the factor used to correct the data in the nth component, which corresponds to variable fn. Mn represents

Comment [WU2]: Show on the Zoning Map the location/position of tourist locations in the form of points/others so that it is clear within the Alas Purwo National Park.

the actual or real condition of the calculated f_n variable, while M_t is the maximum limit associated with the f_n variable. The formula for calculating the correction factor is as follows:

$$C_f = 1 - \frac{M_n}{M_t}$$

Keterangan:

- C_f : Correction Factor (faktor koreksi)
- M_n : Limiting variable size
- M_t : Number of variable sizes

Effective Carrying Capacity / ECC

Effective carrying capacity is a calculation to determine how much the maximum number of areas in accommodating visitors is seen based on the management ability factor. (Sofiyani, et al., 2019). The effective carrying capacity is also seen based on the number of officers responsible for the area. The calculation of effective carrying capacity uses the following formula:

$$ECC = RCC \times MC$$

Keterangan:

- ECC : Effective Carrying Capacity
- RCC : Real Carrying Capacity
- MC : Management Capacity

The formula that can be used to determine the value of Management Capacity (MC), is as follows:

$$MC = \frac{\text{Number of staff on the field}}{\text{Number of staff required}} \times 100\%$$

Tourism Carrying Capacity

$$PCC > RCC \text{ dan } RCC \geq ECC$$

Tourism carrying capacity is determined based on the results of the three previous calculations, namely physical, real and effective carrying capacity. The equation is used to determine the carrying capacity of the entire area. So that later the calculation results can be known whether the overall carrying capacity of the Sadengan Savannah Area is low or high.

RESULTS AND DISCUSSION

Heading

Administratively, Sadengan Savannah National Park is located within the Alas Purwo National Park area. This area is included in Tegaldlimo District, Banyuwangi Regency. According to Law Number 32 of 2009 concerning Environmental Protection and Management, Article 1 paragraph 7, Environmental carrying capacity refers to the environment's capability to sustain human life and other living organisms while maintaining a harmonious equilibrium between the two. It also reflects the environment's capacity to assimilate substances, energy, and other components that are introduced into it. Utilizing the concept of carrying capacity is valuable in determining the optimal and efficient number of visitors that a conservation area can accommodate without causing any harm to its integrity.

The environmental carrying capacity of natural attractions is a measure of the attraction's capacity to handle the influx of tourists within a specific area and time frame. This concept encompasses biogeophysical factors that facilitate tourism activities in a given location or tourist destination without compromising environmental quality or diminishing tourist satisfaction during their visit. Overall, there are two interrelated aspects in tourism management, namely protecting resources and maintaining the quality of the tourist experience. The results of the calculation include (1) Physical carrying capacity; (2) Real carrying capacity; and (3) Effective carrying capacity as follows:

Physical Carrying Capacity

Measurements made using Google Earth, the Sadengan Savannah area around the tourist destination has a total area of 84 hectares, with an estimated picnic area of around 1,250 m². Based on observations at Savana Sadengan, the average visit time is about 2 hours. This tourist area is open from 05.00 to 17.00, with a total of 12 operational hours per day. Based on interviews with 20 tourist respondents who visited Savana

Comment [WU3]: This law has been amended by Law Number 11 of 2020 concerning job creation and increasing the competitiveness of the economy. Quote from other appropriate sources and pass.

Sadengan National Park, the average length of tourist visits was 2 hours.

$$Rf = \frac{\text{length of time the attraction is open}}{\text{rata - rata durasi kunjungan wisata}}$$

$$Rf = \frac{12 \text{ hours/day}}{2 \text{ hours}}$$

$$Rf = 6 \text{ hours}$$

Based on these calculations, the Sadengan Savanna National Park rotation factor is obtained a value of 6. From the above calculations, the PCC value is obtained as follows:

$$PCC = A / Au \times Rf$$

$$PCC = 840.000 / 1250 \times 6$$

$$PCC = 4032$$

Based on the calculation of Physical Support Capacity (PCC), the estimated capacity for the assumed tourist activity area in Sadengan Savanna National Park is approximately 4032 people per day. However, this calculation of physical carrying capacity solely considers time and area factors, neglecting biotic factors that are vital in considering the environmental conditions of the Sadengan Savannah National Park tourist area.

Real Carrying Capacity

Sayan and Atik (2011) conducted a study in the Termessos National Park area of Turkey and identified certain factors, including excessive sunlight, rainfall, storms, erosion, accessibility, and wildlife disturbance, that serve as correction factors restricting the actual number of tourist visits to the area. In a research conducted by Ortega (2011) to determine the true carrying capacity of Marietas Island tourism in the Gulf of California, designated as a National Park, environmental limiting factors were considered. These factors comprised erodibility, accessibility, rainfall, flooding, biology, and vegetation.

The observations conducted in the Sadengan Savanna National Park area indicate that certain biophysical aspects are identified as limiting factors for the

environmental carrying capacity include slope (Cf1), soil erodibility (Cf2), and rainfall (Cf3). Steep slopes will increase the speed of surface flow and the energy carrying the water which causes more soil grains to be carried away by the impact of rain grains and mired downward (Yumai, et al., 2019). The soil erodibility factor describes how strongly soil particles erode and how they are transported by the kinetic energy of rainwater (Injilina, et al., 2020). Rainfall intensity describes the amount of rainfall in a certain period of time, and if the intensity is large, it can cause heavy rainfall that has the potential to cause flooding, landslides, and negative impacts on crops. (Maulidani S, et al., 2015). The selection of three rotation factors was carried out because the Sadengan location has different slope variations, the development of flora and fauna in Sadengan savanna is very dependent on soil erodibility in its habitat, and rainfall affects the carrying capacity of tourism in Sadengan savanna. This parameter is also used because Sadengan Savanna National Park has a relatively flat topography with few hills with an altitude of 0 - 322 meters above sea level.

Comment [WU5]: Slope and soil erodibility are the main limiting factors for biophysics besides rainfall.
 1. Describe the slope classes in the research area that which slope class (Table 1) has the most influence and its area (ha).
 2. Describe the most influential soil erodibility factors (Table 2) and their extent.
 So it is more precise to assess each weather class factor and each Soil Type Classification factor and sensitivity to soil erosion.

Comment [WU4]: Include biotic factors which are part of the carrying capacity that is taken into account and other supporting facilities (availability of clean water, toilets, places of worship, places of waste management, medical teams, etc.) so that Sadengan Savanah National Park tourism is 'sustainable and sustainable'

Comment [WU6]: Add a column for the area (ha) of each Slope Class with a total area equal to the area of the Sadengan Savanna National Park/research area.

Table 1. Slope Classes

Slope Classes	Slope Class Classification (%)	Description
1	0 - 8	Flat
2	8 - 15	Ramps
3	15 - 25	Slightly Steep
4	25 - 40	Steep
5	>40	Very steep

Source: SK.Menteri Pertanian No.837/KPTS/UM/11/1980 in Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 10 (2022)

This area has soil types of brown Mediterranean, reusol, gray grumusol and hydromof alluvial. In the soil classification, the soil sensitivity index to erosion in the Sadengan Savanna area has a non-sensitive soil type which has a value of 13.

Tabel 2. Soil Type Classification

soil grade	Soil Type Classification	Description	Score
1	Alluvial, gley soil, pansol, hydromorph, lateria groundwater	Not Sensitive	15
2	Latosol	Slightly Sensitive	30
3	Brown forest soil, non calcic	Less Sensitive	45
4	Andosol, lateritik, gromosol	Sensitive	60
5	Regosol, litosol, organosol	Very Sensitive	75

Comment [WU7]: Add a column for the area (ha) of each Soil Type with a total area equal to the area of the Sadengan Savanna National Park/research area.

Source: SK.Menteri Pertanian No.837/KPTS/UM/11/1980 in Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 10 (2022)

Table 3. Total Rainfall (mm) per Month, 2011-2021

Month	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
January	181,6	340,1	527,5	216,6	150,1	116,1	244	474,3	236,4	136,3	252,1
February	103,3	134,1	100,2	227,3	202,7	238,5	224,8	276	81,9	257	408,8
Maret	139,6	94,7	193,1	28,3	225,9	66,9	121,1	161,9	210,8	217,1	210
April	144,3	53,3	228,8	127	84,3	48,7	83,7	28,9	239,5	40,7	207,1
May	107,1	87,1	97,3	19,4	87,1	100	150,9	5,9	26,1	232,4	58,2
June	24,8	15,3	122,8	16,9	58,8	172,7	173,2	33,1	15,5	77,9	248,6
July	41,8	35,8	156	136,1	TTU	81,9	118,4	68,5	-	81,7	62,4
August	8	10,7	37,3	24,3	14,9	145,1	48,2	69,4	6,8	48	65,2
September	4	11,5	6,9	TTU	0,8	22,8	9,3	9	29,7	93,9	154
October	40,8	6,3	0,8	36,5	TTU	76,7	113,2	0,7	-	242	99
November	104,3	79,6	237,6	91,5	TTU	121,7	192,5	239,2	2,8	28,6	180,3

Source: Meteorology Climatology and Geophysics Agency, Banyuwangi Meteorological Station

Table 4. Wet and Dry Month Calculation

Year/Month	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ΣCH	R CH
January	181,6	340,1	527,5	216,6	150,1	116,1	244	474,3	236,4	136,3	252,1	2 875,10	479,18
February	103,3	134,1	100,2	227,3	202,7	238,5	224,8	276	81,9	257	408,8	2 254,60	375,77
March	139,6	94,7	193,1	28,3	225,9	66,9	121,1	161,9	210,8	217,1	210	1 669,40	278,23
April	144,3	53,3	228,8	127	84,3	48,7	83,7	28,9	239,5	40,7	207,1	1 286,30	214,38
May	107,1	87,1	97,3	19,4	87,1	100	150,9	5,9	26,1	232,4	58,2	971,5	161,92
June	24,8	15,3	122,8	16,9	58,8	172,7	173,2	33,1	15,5	77,9	248,6	959,6	159,93
July	41,8	35,8	156	136,1	TTU	81,9	118,4	68,5	-	81,7	62,4	782,6	142,29
August	8	10,7	37,3	24,3	14,9	145,1	48,2	69,4	6,8	48	65,2	477,9	79,65
September	4	11,5	6,9	TTU	0,8	22,8	9,3	9	29,7	93,9	154	341,9	62,16
October	40,8	6,3	0,8	36,5	TTU	76,7	113,2	0,7	-	242	99	616	112
November	104,3	79,6	237,6	91,5	TTU	121,7	192,5	239,2	2,8	28,6	180,3	1 278,10	232,38

Year/Month	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	ΣCH	R CH
December	195,5	156,4	160,3	172,8	148,2	255,7	276,6	97,6	11,8	148,9	270,9	1 894,70	315,78
ΣCH	3106	3037	3882	3111	2988	3463	3773	3483	2880	3625	4238	37583,7	6264
BB	7	3	8	5	4	7	9	4	3	6	8	64	10,7
BK	5	9	3	6	4	5	3	7	7	6	4	59	9,8
BL	0	0	1	0	1	0	0	1	2	0	0	5	0,8
TTU	0	0	0	1	3	0	0	0	0	0	0	4	0,7

Source: Research Result, 2023

$$\frac{BK}{BB} = \frac{59}{64} = 0.922 \text{ (temperate climate type)}$$

$$MC = \frac{8}{10} \times 100\% = 0,8$$

Comment [WU8]: Source Classification

In tables 2, 3, and 4 it can be seen that dry months are more dominant than wet months. Calculation of dry months can be seen with rainfall <60 mm and wet months >100 mm. The Q value index which is the ratio of the number of dry months and wet months for the last ten years from 2011 to 2021 is 0.92.

Calculation of real carrying capacity (RCC) as follows:

Table 5. Calculation of Real Carrying Capacity

Indicator	Limit	Sadengan	CF Score
Precipitation	7	0,922	0,868571429
Soil Erodibility	75	13	0,826666667
Land Slope	40	4	0,9
RCC = PCC x Cfn			2605,54752

From the results of the RCC calculation, the number of people visiting per day is around 2,605 people.

Effective Carrying Capacity

At Sadengan Savannah National Park, there are only 8 staff in the field, while 10 staff workers should be needed. Of these, the majority of existing staff are freelancers who are not Civil Servants (PNS). So, the MC value is obtained in the following calculation:

$$MC = \frac{\text{Number of staff available in the field}}{\text{Number of staff required}} \times 100\%$$

$$ECC = RCC \times PCC = 2605 \times 0,8 = 2084$$

Referring to the results of the physical carrying capacity (PCC), the capacity of Sadengan National Park is 4,032 people per day, while the calculation of the real carrying capacity (RCC) of Sadengan Savanna National Park is 2,605 people per day. The calculation of the effective carrying capacity (ECC) only accommodates 2,084 people per day. The manager has limited visitors in the Sadengan Savannah area in order to maintain the habitat of the animals in it. Every day, visitors in Sadengan Savanna do not exceed 3,000 people per day. The staff working at Savana Sadengan is dominated by contract workers, not civil servants.

Comment [WU9]: Source Classification

Maintaining the increased capacity of the management staff in catering to visitor needs should be overseen by the manager's capacity. Enhancing their abilities and preparing for potential declines in management capacity is vital, particularly during the peak tourist season when the number of visitors surpasses the effective carrying capacity.

CONCLUSION

The analysis and discussion conducted in this study have shown that the physical carrying capacity (PCC) exceeds both the actual carrying capacity (RCC) and effective carrying capacity

(ECC). The calculated carrying capacity for tourism in Sadengan Savanna National Park demonstrates the order of $PCC > RCC > ECC$. This indicates that the park has the capacity to effectively accommodate tourists and their activities, as long as the actual number of visitors does not surpass the maximum limit defined by the RCC value.

In the planning and development process, the concept of carrying capacity plays a pivotal role in assessing the capacity of both natural and artificial environmental systems to meet demands that go beyond their natural limitations. This is crucial to prevent potential environmental degradation or damage. While certain physical limitations of the environment can be managed, it is essential to acknowledge that compensatory measures may be required to avert risks or hazards that could arise from exceeding the carrying capacity. By carefully considering the carrying capacity, sustainable development practices can be adopted, ensuring the balance between human needs and environmental preservation.

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Comment [i-10]: Because this study applies carrying capacity, I recommend citing articles that also use similar methods; eg. "Effect of S Damage on Carrying Capacity of Biomass Production: A Lesson from Tanjung Selor District-Tanjung Redeb, Indonesia" (2022).

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