Jurnal Pendidikan Geografi: Kajian, Teori, dan Praktek dalam Bidang Pendidikan dan Ilmu Geografi

Volume 29 | Number 2 Article 7

2024

An analysis of the carrying capacity of Lokawisata Baturraden in Banyumas Regency to support sustainable tourism

Annisa Nadia Candraningtyas
Universitas Gadjah Mada, Indonesia, candraningtyas99@mail.ugm.ac.id

Aude Lathif Eriawan
Universitas Gadjah Mada, Indonesia, audelathif2020@mail.ugm.ac.id

Beta Lavenda Kurnianingtyas
Universitas Gadjah Mada, Indonesia, betalavenda@mail.ugm.ac.id

Nur Azizah
Universitas Gadjah Mada, Indonesia, nurazizah.na2671@mail.ugm.ac.id

Qorisa Nur Laila
Universitas Gadjah Mada, Indonesia, qorisanur01@mail.ugm.ac.id

See next page for additional authors

Recommended Citation
Candraningtyas, Annisa Nadia; Eriawan, Aude Lathif; Kurnianingtyas, Beta Lavenda; Azizah, Nur; Laila, Qorisa Nur; Nugroho, Sulistiawan Fajar; Nuraziizah, Tashya; Lusiana, Vivi; and Budiani, Sri Rahayu (2024) "An analysis of the carrying capacity of Lokawisata Baturraden in Banyumas Regency to support sustainable tourism," *Jurnal Pendidikan Geografi: Kajian, Teori, dan Praktek dalam Bidang Pendidikan dan Ilmu Geografi*: Vol. 29: No. 2, Article 7.
DOI
10.17977/um017v29i22024p196-207
Available at: https://citeus.um.ac.id/jpg/vol29/iss2/7

An analysis of the carrying capacity of Lokawisata Baturraden in Banyumas Regency to support sustainable tourism

Authors

Annisa Nadia Candraningtyas, Aude Lathif Eriawan, Beta Lavenda Kurnianingtyas, Nur Azizah, Qorisa Nur Laila, Sulistiawan Fajar Nugroho, Tashya Nuraziizah, Vivi Lusiana, and Sri Rahayu Budiani

Jurnal Pendidikan Geografi:
Kajian, Teori, dan Praktik dalam Bidang Pendidikan dan Ilmu Geografi, 29(2), 2024, 196-207
ISSN: 0853-9251 (Print): 2527-628X (Online)
DOI: 10.17977/um017v29i22024p196-207

An analysis of the carrying capacity of Lokawisata Baturraden in Banyumas Regency to support sustainable tourism

Annisa Nadia Candraningtyas*, Aude Lathif Eriawan, Beta Lavenda Kurnianingtyas, Nur Azizah, Qorisa Nur Laila, Sulistiawan Fajar Nugroho, Tashya Nuraziizah, Vivi Lusiana, Sri Rahayu Budiani

Universitas Gadjah Mada, Bulaksumur, Caturtunggal, Kapanewon Depok, Sleman Regency, Special Region of Yogyakarta, 55281, Indonesia
*Corresponding author, Email: candraningtyas99@mail.ugm.ac.id

Paper received: 30-07-2023; revised: 11-01-2024; accepted: 29-04-2024

Abstract

The tourism sector plays a pivotal role in driving the country's economy. Despite its significant influence on the economic sector, its improper and incorrect management will result in the destruction of the environment. This study aims to estimate the carrying capacity of Lokawisata Baturraden, Banyumas Regency, in order to support sustainable tourism management and development. Primary and secondary data were used in this study, as was the comparison method for the data analysis. The results indicated that the Physical Carrying Capacity (PCC) was 39.970, the Real Carrying Capacity (RCC) was 6.715, and the Effective Carrying Capacity (ECC) was 4.291. Based on these findings, it can be concluded that Lokawisata Baturraden has the physical capacity to accommodate the number of tourists and their activities when the actual number of tourists does not exceed the maximum threshold of its Physical Carrying Capacity (PCC).

Keywords: carrying capacity; Baturraden tourism site; sustainable tourism

1. Introduction

Tourism is a movement of people seeking pleasure in travel or destination sites (Yulianda, 2007). The tourism sector exhibits a pivotal role in driving a country's economy, thereby, countries are competing to develop their tourism industries. Edgel et al. (2014) posited the possible significant transformation of tourism policy and strategic planning in the future. Although it has a substantial role in economic development, the poorly planned and managed tourism sector will present a detrimental impact on the environment. Therefore, it is essential to adopt a sustainable approach to tourism development, ensuring that tourist destinations are managed in both economically beneficial and environmentally responsible means (Kapantow, 2004).

Banyumas Regency, Indonesia, presents a plethora of tourist attractions, encompassing both natural and artificial forms of tourism. One of the most popular tours in Banyumas Regency is the Baturraden Tourism Site (Martina & Syarifuddin, 2014). The Baturraden Lokawisata is situated at the foot of Mount Slamet, at an altitude of approximately 640 meters above sea level, with convenient transportation access (Nofiana, 2018). The Baturraden area is a tourist destination in Banyumas that is renowned for its natural attractions. Its location at the foot of Mount Slamet, between slopes and characterized by cold weather, provides a unique setting for natural beauty. The area's appeal extends beyond its natural attraction, with the large number of tourist attractions offering a diverse range of experiences, including rides and

activities, that are particularly appealing to visitors. The tourist attraction is the mainstay of Banyumas Regency, contributing the largest percentage of revenue to the region (Azhar et al., 2017). This is in line with the large number of visitors to the tourist attraction, with 408,476 visitors observed coming to the Baturraden Tourism Site in 2022 (Central Bureau of Statistics of Banyumas Regency, 2023). The number of visitors at this tourist attraction is the highest compared to other tourist attractions. However, the large number of visitors at the Baturraden Tourism Site can potentially lead to environmental degradation if not managed properly.

The number of tourists in a tourist destination that exceeds the carrying capacity of tourism can lead to a lack of comfort and a supportive atmosphere for tourists, which is known as "overtourism" (Sutanto & Setiadi, 2020). The calculation of the carrying capacity of tourism is crucial, serving as a reference point to ensure that tourism activities in the Baturraden Tourism Site do not exceed their carrying capacity, thereby facilitating the achievement of sustainable tourism. Following the aforementioned discussion, it is imperative to conduct research on the carrying capacity of the Baturraden Tourism Site destination. Consequently, the purpose of this study is to estimate the carrying capacity of Baturraden Tourism, Banyumas Regency.

2. Method

2.1. Research Location and Time Allocation

This research was conducted in the Baturraden tourist area, Karangmangu Village, Baturraden District, Banyumas Regency, Indonesia. The location was selected due to the constantly growing tourism attraction in the Baturraden tourist site. Tourism quality can be done by calculating tourism carrying capacity. This research was conducted for one month, in June 2023. The map of the Baturraden tourism area is illustrated in Figure 1.

2.2. Data Collection Method

This research employed primary and secondary data. The primary data were garnered from interviews with the management staff of the Baturraden Tourism Site. Sampling of tourists in the Baturraden Tourism Site was performed using random sampling techniques with samples selected accidentally (accidental sampling). The accidental sampling technique was conducted by selecting research samples based on populations with certain characteristics. Through this sampling technique, a sample of 40 respondents was obtained. Meanwhile, secondary data contained rainfall data, slope data, and erodibility data. Rainfall data was obtained from the Central Bureau of Statistics of Banyumas Regency in 2022 based on the Rempoah Baturrraden rain station processed using the Schmidt-Ferguson rainfall index formula. Slope data was collected from DEMNAS, which was adjusted to the location of Baturraden Tourism. Erodibility data was obtained from data on soil types in the Baturraden Tourism Site area. The sources of these data are summarized in Table 1.

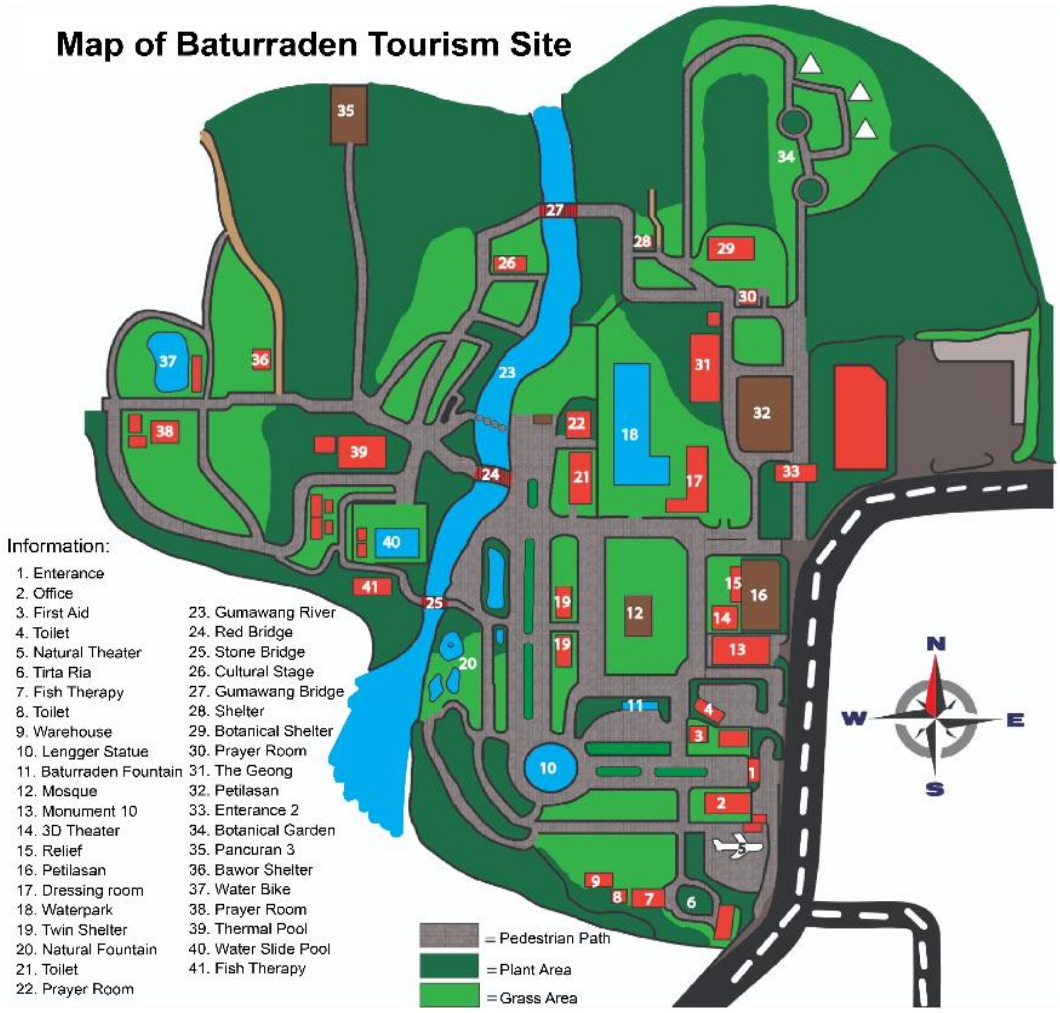

Figure 1. Map of Baturraden Tourism Site

Table 1. Data Collection Sources for the Baturraden Tourism Site Study

No	Data	Source of Data
Primary Data		
1	Required space between tourists (m^2)	Structured interview using a questionnaire instrument
2	The opening hour of the tourism destination (hour)	Structured interview using a questionnaire instrument
3	Average tourists visit (hour)	Structured interview using a questionnaire instrument
4	Tourist area (m^2)	Structured interview using a questionnaire instrument
Secondary Data		
1	Rainfall	Central Bureau of Statistics in 2022
2	Slope	DEMNAS
3	Soil erodibility	Geological Map of Banyumas Regency

2.3. Data Analysis

2.3.1. Physical Carrying Capacity (PCC)

The Physical Carrying Capacity (PCC) represents the maximum capacity to physically accommodate visitors or tourists within a certain time. PCC can be measured by the Physical Carrying Capacity formula proposed by Cifuentes (1992). The PCC calculation formula is presented in the following.

$$PCC = A \times \frac{1}{B} \times Rf \quad (1)$$

Description:
PCC = Physical Carrying Capacity
A = Tourist area (m^2)
B = Area required for the needs of tourist comfort and satisfaction (m^2)
Rf = Rotation factor or duration of one-day visit

Obtained by comparing opening hours of tourist destinations and the average duration of tourist visits (Nghi et al., 2007).

2.3.2. Real Carrying Capacity (RCC)

The Real Carrying Capacity (RCC) is the number of visits that can be accommodated based on the correction factor (CF), which is derived from the Passenger Carrying Capacity (PCC) calculation to determine the number of visitors who can be transported for travel. RCC was quantified using the Cifuentes (1992) Real Carrying Capacity formula with modifications. The formula used to measure RCC is presented in the following.

$$RCC=PCC \times Cf1 \times Cf2 \times \ldots \times Cfn \quad (2)$$

Description:
RCC = Real Carrying Capacity
PCC = Physical Carrying Capacity
Cfn = Correction factor

Correction factors can be obtained by considering biophysical variables in the tourist attraction area, such as land slope, erodibility, and rainfall as a limiting factor for RCC (Aulia, 2017). The correction factor was calculated using the following formula.

$$Cfn = 1 - \frac{(Mn)}{(Mt)} \quad (3)$$

Description:
Cfn = Correction factors
Mn = The real condition of the calculated n variable
Mt = Maximum limit on the n variable

In addition, each biophysical variable has different indicators. The following are the indicators used in each biophysical variable.

2.3.2.1. Slope (Cf1)

Slope is one of the biophysical variables that affect the comfort of visitors during their travel. The slope is calculated based on the scoring system of slope class criteria according to the Decree of the Minister of Agriculture Number 837/KPTS/UM/11/1980 and Number 683/KPTS/UM/8/1981 according to Table 2.

Table 2. Criteria for Slope Scoring System

Class of Slope	Classification of Class of Slope (%)	Description	Score
1	0 – 8	Flat	20
2	8 – 15	Ramps	40
3	15 – 25	Relatively Steep	60
4	25 – 45	Steep	80
5	45 or higher	Highly Steep	100

2.3.2.2. Soil Erodibility (Cf2)

Soil erodibility or soil sensitivity symbolizes the ease of soil experiencing erosion (Arsyad & Nurhayati, 2017). The higher soil erodibility value indicates a greater possibility of erosion or landslides. Soil erodibility assessment is carried out based on soil types, which are divided into several categories, as presented in Table 3.

Table 3. Criteria of Soil Erodibility based on Types of Soil

Class of Soil	Types of Soil	Description	Score
1	Alluvial, Glei Planosol, Gray Hydromof, Groundwater Literia	Non-sensitive	15
2	Latosol	Relatively sensitive	30
3	Brown Forest Soil, Non-Calcis Brown, Mediterranean	Less sensitive	45
4	Andosol, Laterite, Grumosol, Podsol, Podzolic	Sensitive	60
5	Regosol, Litosol, Organosol, Renzina	Highly sensitive	75

2.3.2.3. Rainfall (Cf3)

Rain intensity presents effects on visitor comfort when traveling as rain limits tourism activities (Dewi et al., 2021). Rainfall was measured using the Schmidt-Ferguson rainfall index formula. The result was derived from the comparison between dry and wet months, employing the following formula.

$$Cf3 = 1 - Q \quad (4)$$

$$Cf3 = 1 - \left(\frac{(\bar{x} \text{ on dry months})}{(\bar{x} \text{ on wet months}}\right) \quad (5)$$

Further, the results of rainfall measurements enable the determination of climate conditions in a particular area based on the tropical climate criteria following Schmidt-Ferguson presented in Table 4.

Table 4. Criteria of Tropical Climate based on Schmidt-Ferguson

Climate	Values of Q	Characteristic
A	0 – 0,143	Very wet
B	0,143 – 0,333	Wet
C	0,333 – 0,6	Slightly wet
D	0,6 – 1	Moderate
E	1 – 1,67	A bit dry
F	1,67 – 3	Dry
G	3 – 7	Very dry
H	>7	Extremely dry

Source: Aulia (2017)

2.3.3. Effective Carrying Capacity (ECC)

Effective Carrying Capacity (ECC) demonstrates the maximum visitor capacity for preserving tourist areas that consider Management Capacity (MC). ECC was measured using the Effective Carrying Capacity formula from Cifuentes (1992), as presented in the following.

$$ECC = RCC \times MC \quad (6)$$

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

The Management Capacity is measured by comparing the percentage of active staff in the field with the total number of staff. The Management Capacity was calculated using the following formula.

$$MC = \frac{(\text{total number of staffs on the field})}{(\text{total number of permanent or available staff})} \times 100\% \quad (7)$$

2.3.4. Data Analysis Method

The carrying capacity of the Baturraden Tourism Site was measured using the comparison method. The analysis results were construed from the obtained PCC, RCC, and ECC values, as well as with the actual total tourist visits in Baturraden Tourism. The value is compared with the following conditions.

$$PCC > RCC \geq ECC \quad (8)$$

Following the comparison, the value of $PCC > RCC \geq ECC$ represents a relatively good carrying capacity of tourism in the area. Further, this value suggests the possibility of the manager to keep investing in the tourism site to enhance the number of tourists before it reaches the limit of tourism numbers from the above calculation. However, a more excellent ECC value than RCC and a higher RCC than PCC indicate that the total number of visitors has

exceeded the carrying capacity of the area. In that situation, the manager needs to implement visit management to ensure that tourism at the tourist attraction remains sustainable.

3. Results and Discussion

3.1. Physical Carrying Capacity

Physical Carrying Capacity (PCC) is defined as the maximum number of visitors or tourists that can be accommodated within a given period. The assessment of Physical Carrying Capacity is conducted to achieve sustainable tourism, thereby facilitating the realization of environmental sustainability and harmony. The value of Physical Carrying Capacity in a tourist attraction can be obtained by calculating the area of the tourist attraction (A), the area needed by visitors to travel while still obtaining comfort and satisfaction (B), and the rotation factor (Rf) obtained by comparing the operating hours of the tourist attraction with the average length of time of tourist visits.

Baturraden Tourism offers a diverse range of tourist attractions, including waterparks, hot springs, water bikes, amphitheaters, photo spots, and many more. The variety of these tours is a significant advantage and attraction in Baturraden tourism. Besides, the size of the Baturraden tourism site is also a key influencing factor in the number of tourist visits. The results of interviews conducted with the manager indicate that the 8 ha area of the Baturraden Lokawisata tourist attraction is currently utilized as an intensive tourist attraction (A) from its total utilization area of 14.8 ha. The Baturraden tourism site area is open year-round, operating for 9 to 10 hours daily, from 07:00 a.m. to 5 p.m. Further, the average duration of visits was calculated by categorizing the visit into four groups, namely 1-2, 3-4, 5-6, and 7-8 hours (Sayan & Atik, 2011). The same calculation method was also employed to ascertain the average area or space required by tourists, namely 1-4 m^2, 9-16 m^2, 25-36 m^2, and 49-64 m^2. Table 4 shows the required space by tourists.

Table 4. Required Space by Tourists

No	Required space	Mean Value	Frequency	Percentage
1	1-4 m^2	2.5	22	55%
2	9-16 m^2	12.5	6	15%
3	25-36 m^2	30.5	10	25%
4	49-64 m^2	56.5	2	5%

Table 4 suggests that the average required space for the respondents to complete the tourism activities in the Baturaden tourism site comfortably is 2.5 m^2. By using data from Table 4, the average required space was calculated using the following calculation.

$$\bar{x} = \frac{(2.5 \times 22)+(12.5 \times 6)+(30.5 \times 10)+(56.5 \times 2)}{40} \quad (9)$$

$$= \frac{548}{40}$$

$$= 13.7\ m^2$$

From the calculation results, the average space area for the tourists is 13.7 m^2 to carry out the tourism activities comfortably, satisfyingly, and freely. Meanwhile, the average visit duration of the tourist is presented in Table 5.

Table 5. Tourist Visit Duration

No	Visit Duration	Mean Value	Frequency	Percentage
1	1-2 hours	1.5	10	25%
2	3-4 hours	3.5	18	45%
3	5-6 hours	5.5	12	30%

Table 5 indicates that, on average respondents take 1 to 2 hours in visiting the Baturraden tourism area. Based on this data, the average duration of tourist visits is 2.7 hours, as presented in the following calculation.

$$\bar{x} = \frac{(1.5\ x\ 10)+(3.5\ x\ 8)+(5.5\ x\ 12)}{40} \quad (10)$$

$$= \frac{109}{40}$$

$$= 2.7 \text{ hours}$$

In addition, using the obtained data, the rotation factor (Rf) in the Baturraden tourism attraction area was calculated using the following formula.

$$Rf = \frac{(\text{tourism opening hours})}{(\text{x visit duration})} \quad (11)$$

$$= \frac{10}{2.7}$$

$$= 3.7 \text{ m}$$

Using the required space area and the rotation factor, the Physical Carrying Capacity of the Baturraden tourist area was calculated with Formula 1. The results of the calculations indicate that the Baturraden tourism site can accommodate a maximum of 39,970 tourists per day. Based on the Physical Carrying Capacity analysis, the number of visitors at the Baturraden tourism site over the past year can be classified as below the maximum capacity of the tourist area. This condition is consistent with the findings of Marcelina (2018), which reveal that a smaller number of visitors leads to lesser potential damage to the environment and supporting facilities. However, it should be noted that the PCC value does not yet account for biophysical factors in the field, thereby, the environmental conditions at the Baturraden tourism site have not yet been included in the calculation of the carrying capacity. Meanwhile, Soemarwoto (1991) posits that biophysical environmental factors exert a profound influence on an ecosystem, affecting the carrying capacity of the tourism environment. Consequently, this research employs a comprehensive approach to calculate the actual carrying capacity by incorporating a range of biotic and abiotic variables, which serve as correction or limiting factors for the Physical Carrying Capacity value. Furthermore, the Effective Carrying Capacity of the tourist attraction is estimated by considering the Management Capacity factor of the manager.

3.2. Real Carrying Capacity

Real Carrying Capacity (RCC) illustrates the maximum number of visitors who can be accommodated in a tourist attraction by considering correction factors. Cifuentes (1992) described that each tourist attraction is affected by a series of various correction or limiting factors. In this study, biophysical variables in the form of slope, soil erodibility, and rainfall were adopted as correction or limiting factors for the number of real tourist visits to the Baturraden tourism site. These variables were selected due to their influence on the ecosystem sustainability in the tourist attraction area, which, in turn, affects visitor comfort and satisfaction in traveling.

3.2.1. Slope

The slope of a tourist area is perceived as both a facilitating and an impeding factor. The degree of slope is believed to influence the number of visitors to a given location, and it can indirectly or directly influence the area's carrying capacity. Sustri (2009) posits that the slope can influence the trajectory of development in a tourist area, the utilization of tourist facilities deemed appropriate, the sitting of buildings, and other visual elements. These considerations can be observed from the characteristics of the slope in the context of tourism. For instance, steep slopes can result in increased energy expenditure and fatigue among tourists, which can impact their enjoyment of natural environments.

The data analysis indicates that the Baturraden tourism site has a slope of 15%-25%. Further, following the scoring system of slope class criteria in the Decree of the Minister of Agriculture No. 837/KPTS/UM/11/1980 and No. 683/KPTS/UM/8/1981, the slope in Baturraden Tourism is included in the rather steep category with a value of 60. Referring to these data, the value of Mn is 60 and Mt is 100. Based on Formula 3, the value of the slope correction factor (Cf1) is 0.4.

3.2.2. Soil Erodibility

Based on the obtained secondary data, the soil in the Baturraden tourism site area is brown forest soil. Generally, the brown forest soil experiences structural changes from the rock of origin and has little nutrient content. This type of soil also has varying textures and fertility. Based on the Decree of the Minister of Agriculture Number 837/KPTS/UM/11/1980 and Number 683/KPTS/UM/8/1981, brown forest soil is categorized as less sensitive to erosion with a score of 45. From these data, its Mn value is 45, and Mt is 75. Based on measurements using Formula 3, the correction factor for the soil erodibility (Cf2) is 0,4.

3.2.3. Rainfall

Rainfall is one of the influencing variables in tourism activities. High-intensity rainfall at tourist sites has been shown to hinder tourism activities and comfort (Sasmita, 2014). Fluctuations in rainfall were observed around Rempoah Baturraden Station during 2022. The rainfall data from the Central Bureau of Statistics indicates that the highest rainfall in 2022 in the area around Rempoah Baturraden Station was 850 mm, occurring in October with 28 days of rain. The lowest rainfall was 93 mm, observed in July with 10 days of rain. The number of days on which visitors are present at the Baturraden tourism site is 365, as the facility is open for a full year. The data was then processed using the rainfall index formula by Schmidt-

Ferguson, which resulted in a value of 0.7. This value indicates that the rainfall around the Baturraden tourism site is of the very wet type in the Schmidt-Ferguson classification. Based on measurements using Formula 3, the obtained correction factor (Cf3) for the rainfall is 0.3.

After the assessment of correction factors, the RCC value of the Baturraden tourist site was measured using Formula 2. The Real Carrying Capacity of the Baturraden tourism site is calculated to be 1,918 to 1,919 tourists per day. This figure considers the limiting factors of slope, soil erodibility, and rainfall. This value is considerably higher than the number of visits on weekdays and weekends. On weekdays, the number of visitors is approximately 500, while on weekends, it ranges from 1,000 to 3,000. However, these values are considerably lower than the number of visits on Eid al-Fitr, which is estimated to be between 10,000 and 15,000. Consequently, it is imperative that various management strategies be employed at the Baturraden tourism site, particularly during Eid and other holidays, in order to regulate tourist visits and ensure the comfort of tourists.

3.3. Effective Carrying Capacity

Effective Carrying Capacity shows the maximum number of visits that can be accommodated by the Baturraden tourism site by considering the Management Capacity at any given time. The capacity of management personnel at Baturraden tourism is a crucial factor in the effective operation of the facility. The employees at the Baturraden tourism site constitute a working group with a variety of responsibilities, including secretarial duties, information dissemination, management of the main entrance, two additional entrances, the waterboom swimming pool, water bikes, fruit market operations, maintenance of the garden, and general maintenance. The Lokawisata workforce comprises 64 employees, with an alternating work schedule that allows for approximately 10 individuals to be off duty each day. A total of 51 employees are currently on duty in the field. This workforce distribution is used to calculate the Management Capacity (MC). Using the Formula 7, the MC value is determined to be 79.69%. Consequently, the calculation of the Effective Carrying Capacity (using Formula 6) results in a value of 1.5, which is practically equivalent to 1-2 visitors per day.

The obtained Effective Carrying Capacity (ECC) for the Baturraden tourism site is 1,528-1,529 visitors per day. This finding suggests that 51 employees on duty in the field can optimally assist as many as 1,528 - 1,529 visitors per day. This total number of visitors is far above the number of visits on weekdays and weekends, which are around 500 visitors/day and 1,000-3,000 visitors/day, respectively. However, during the Eid Al-Fitr holiday, the number of visitors exceeds that amount, reaching 10,000-15,000 visitors/day. It can be argued that tourist visits that exceed the carrying capacity on holidays do not cause damage to tourist attractions, given that tourist visits on other days are still below the carrying capacity.

3.4. Analysis of Carrying Capacity on Baturraden Tourism Site

The analysis of the carrying capacity of the Baturraden tourism site was performed based on the results of the calculation of Physical Carrying Capacity (PCC), Real Carrying Capacity (RCC), and Effective Carrying Capacity (ECC), with the equation PCC > RCC ≥ ECC (Sasmita, 2014) yields the following values: 39,970 > 1,919 > 1,529. The results indicate that the maximum number of tourists that can be physically accommodated by the Baturraden tourism site, with an area of 14.8 hectares, is 39,970 visitors per day. Conversely, when several

correction factors affecting tourism activities in the Baturraden tourism site are considered, the number of tourists that can be accommodated is 1,919 people per day. Consequently, the maximum number of tourists that can be accommodated by the Baturraden tourism site, considering its biophysical correction factors and tourist attraction Management Capacity, is 1,529 people, similar to its Real Carrying Capacity value. Therefore, it can be concluded that the current carrying capacity of the Baturraden tourism site is still able to accommodate tourists and activities properly.

Conversely, when the actual conditions are considered during the analysis of tourist visits in the Baturraden tourism site, the number of visitors during the peak season reaches 10,000-15,000 individuals per day. This indicates that during the peak season, the number of tourist visits to the Baturraden tourism site has exceeded its actual and Effective Carrying Capacity. In contrast, during the low season, the Baturraden tourism site is better able to accommodate visitors as the number of visitors is below the allowable threshold value. Consequently, the management should cope with the large number of visitors who come to prevent and overcome the decline in carrying capacity in the area. The exceeding value of the Real Carrying Capacity (RCC) and Effective Carrying Capacity (ECC) by the actual number of visits to the Baturraden tourism site does not directly result in a decrease in the environmental quality of the tourist attraction. Further in-depth studies are therefore required in order to identify the impact of visitor visits.

4. Conclusion

The Baturraden tourism site, a natural tourist destination renowned for its allure and sustainability, is confronted with potential environmental risks as the number of visitors increases. To ensure long-term viability, a sustainable tourism approach is imperative, necessitating the utilization of carrying capacity evaluations for the purpose of development and management. The analysis of Baturraden's carrying capacity reveals that its Physical Carrying Capacity (PCC) is considerably higher than its real and effective carrying capacities, indicating that the site can accommodate a greater number of visitors than is currently recorded. Nevertheless, exceeding the threshold of 39,970 visitors per day may result in adverse environmental consequences.

Conflict of Interest

Authors state no conflict of interest.

Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

References

Arsyad, S. S., & Nurhayati, S. (2017). Determinan fertilitas di Indonesia. *Jurnal Kependudukan Indonesia*, *11*(1), 1–14.

Aulia, D. B. (2017). *Analisis daya dukung lingkungan di objek wisata hutan pinus Mangunan Kabupaten Bantul*. Universitas Gadjah Mada.

Azhar, R. M., Suparno, O., & Djohar, S. (2017). Pengembangan model bisnis pada lokawisata baturaden menggunakan business model canvas. *MANAJEMEN IKM: Jurnal Manajemen Pengembangan Industri Kecil Menengah*, *12*(2), 137–144.

Central Bureau of Statistics of Banyumas Regency. (2023). *Kabupaten Banyumas dalam Angka 2023*.

Cifuentes, M. (1992). *Determinación de capacidad de carga turística enáreas protegidas* (Issue 194). Bib. Orton IICA/CATIE.

Dewi, K., Sastranegara, M. H., & Hilmi, E. (2021). Analisis daya dukung konservasi pada ekowisata Kebun Raya Baturraden di Banyumas. *Jurnal READ (Research of Empowerment and Development)*, *2*(2), 63–72.

Edgel, D. L., Allen, M. D., Smith, G., & Swanson, J. R. (2014). *Tourism policy and planning yesterday, today and tomorrow*. Elsevier.

Kapantow, G. H. M. (2004). *A spatial decision support system for location suitability analysis for sustainable tourism development.* The University of Queensland, Australia.

Marcelina, S. D. (2018). *Studi daya dukung fisik kawasan wisata dan persepsi wisatawan di pusat latihan Gajah Taman Nasional Way Kambas*. Universitas Lampung.

Martina, S., & Syarifuddin, D. (2014). Pengaruh pelatihan dan pengembangan terhadap motivasi dampaknya terhadap prestasi kerja karyawan di Lokawisata Baturraden. *Jurnal Pariwisata*, *1*(1), 28–34.

Ministry of Agriculture. (1980). *Surat Keputusan Menteri Pertanian nomor 837/KPTS/UM/11/1980 tentang Kriteria dan Tata Cara Penetapan Hutan Lindung*. Jakarta: Ministry of Agriculture.

Ministry of Agriculture. (1981). K*eputusan Menteri Pertanian nomor 683/KPTS/UM/8/1981 tentang Kriteria dan Tata Cara Penetapan Hutan Produksi*. Jakarta: Ministry of Agriculture.

Nghi, T., Lan, N. T., Thai, N. D., Mai, D., & Thanh, D. X. (2007). Tourism carrying capacity assessment for Phong Nha-Ke Bang and Dong Hoi, Quang Binh Province. *VNU Journal of Science, Earth Sciences*, *23*(1), 80–87.

Nofiana, M. (2018). Pemanfaatan lokawisata Baturraden dalam pengembangan program Pendidikan Berbasis Keunggulan Lokal (PBKL). *BIOEDUKASI: Jurnal Pendidikan Biologi*, *9*(1), 33–40.

Sasmita, E. (2014). Analisis daya dukung wisata sebagai upaya mendukung fungsi konservasi dan wisata di Kebun Raya Cibodas Kabupaten Cianjur. *Jurnal Manajemen Resort dan Leisure*, *11*(2), 71–84.

Sayan, M. S., & Atik, M. (2011). Recreation carrying capacity estimates for protected areas: A study of Termessos National Park. *Ekoloji*, *20*(78), 66–74.

Soemarwoto, O. (1991). *Ekologi lingkungan hidup dan pembangunan*. Djambatan.

Sustri, S. (2009). *Daya dukung wisata alam di Taman Nasional Kepulauan Togean Sulawesi Tengah*. Universitas Gadjah Mada.

Sutanto, H., & Setiadi, N. J. (2020). Overtourism sebagai keniscayaan dalam pengelolaan pariwisata di Indonesia. *Altasia Jurnal Pariwisata Indonesia*, *2*(2), 233–240.

Yulianda, F. (2007). Ekowisata bahari sebagai alternatif pemanfaatan sumberdaya pesisir berbasis konservasi. *Seminar Sains Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan Institut Pertanian Bogor*, 119–129.