

Original Research Paper

Tourism Carrying Capacity of Torean Hiking Trail, Mount Rinjani National Park

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Abstract: The Torean hiking trail is the newest hiking trail in Mount Rinjani National Park (TNGR). Hiking ecotourism can be an environmentally friendly alternative in managing national parks; however, if it is not adequately supervised, overtourism will occur, degrading the environment and reducing the quality of the visitor experience. To prevent this, it is necessary to know the number of visits allowed by calculating the carrying capacity of the hiking trail and ensuring the capacity is maintained. The data processing technique uses the carrying capacity calculation method by Cifuentes with modifications and correction factors that are suitable for hiking tourism. The results showed that the Torean lama hiking trail (Torean post-Sembalun Torean junction) has a physical carrying capacity of 4,516 people/day, a real carrying capacity of 532 people/day, and an effective carrying capacity of 372 people/day. In comparison, the Torean Baru hiking trail (Birisan Nangka Sembalun Torean junction) has a physical carrying capacity of 4,165 people/day, a real carrying capacity of 333 people/day, and an effective carrying capacity of 233 people/day. The carrying capacity is higher than the actual visitation levels; therefore, tourism activities on the Torean hiking trail do not indicate over-tourism in terms of the number of visits.

Keywords: Ecotourism, Overtourism, Sustainability, Mount Rinjani National Park, Nature Conservation

Introduction

Mount Rinjani National Park Taman Nasional Gunung Rinjani in Indonesian Language, hereafter (TNGR) has various tourism potentials that have been developed into 20 non-hiking tours and six hiking tours. One of the hiking tours is known as the Torean hiking trail. Hiking tours in Mount Rinjani National Park (TNGR) have great concern for the sustainability and preservation of its resources. One issue that threatens the sustainability of tourist destinations is over-tourism, an impact of tourism on a destination that negatively influences the perceived quality of citizens' lives and the quality of visitors' experiences (UNWTO, 2018). Rosenow and Pulsipher (1979) state that the main problems often faced in overtourism are too many visitors, disturbances, and physical impacts on tourist areas.

The sustainability of a tourist destination can be achieved through careful planning by considering each destination's capacity limits and criteria (UNWTO, 2018). This can be determined by calculating the carrying capacity of the area. UNWTO (1981) states that the carrying capacity of tourism is the maximum number of people who can visit a tourist

attraction at the same time without causing damage to the physical, economic, and socio-cultural environment and unacceptable deterioration to visitor satisfaction. Tourism carrying capacity is considered a management instrument for strategies to improve managers' ability to achieve maximum satisfaction and comfort of visitors in enjoying tourist activities in the visited tourist destination. Carrying capacity data can be the basis for preparing strategic plans in various management policies.

National park managers are responsible for determining the carrying capacity once the development has occurred (Martin and Uysal, 1990). They must specify numerical capacities to prevent unwanted damage to the environment, tourism experience, and community social fabric (McCool and Lime, 2001). Tourism carrying capacity research has been carried out on the Sembalun and Senaru hiking trails in Mount Rinjani National Park (TNGR). Meanwhile, the newly opened Torean hiking trail does not yet have data on tourist carrying capacity. This study aims to calculate the value of tourism carrying capacity on the Torean hiking trail as a reference in various future policies for the management and development of the Torean hiking trail.

Materials and Methods

Location and Time

This research was conducted on the Torean hiking trail, Mount Rinjani National Park (TNGR), West Nusa Tenggara Province, Indonesia (Fig. 1). Data collection was conducted from May to July 2022.

Materials and Tools

The tools used in this research included maps of the Torean hiking trail at the Mount Rinjani National Park (TNGR) area, a measuring tape, a clinometer, Global Navigation Satellite Systems (GNSS) receiver, a Digital Single Lens Reflex camera (DSLR) namely canon EOS 200D II (EF-S 18-55 mm f/4-5.6 IS STM), audio recorder, stationery, tally sheets and interview guidance. The software used were Microsoft Office, ArcGIS 10.8, and Avenza Maps 3.14.

Data Collection

Data collection was carried out using field observation methods, interviews, and literature studies. Field observations were carried out to obtain hiking trail length and land slope data. Interviews with national park officials are conducted to obtain data on tourist visits, hiking programs, and hiking trail management policies. Hiker interviews are conducted to determine the assessment of the hiking trail infrastructure, visitor services, the time required to hike, the minimum comfortable distance between visitors, and the impression of hiking on the Torean hiking trail. The literature study was carried out by searching for documents and reports from the management and rainfall data for the last five years.

Data Analysis

The data processing technique in this study was carried out using the carrying capacity processing method proposed by Cifuentes (1992) by assessing physical carrying capacity, real carrying capacity, and effective carrying capacity. The method's logic is based on site-specific factors, which reduce the level of visitation and consider the limiting factors of the areas.

1. Physical Carrying Capacity (PCC)

The Physical Carrying Capacity (PCC) is the maximum number of tourists that can be physically accommodated by the space provided at a particular time:

$$PCC = A \times \frac{V}{a} \times R_f$$

where,

PCC = The physical carrying capacity

A = Length of hiking trail (meters)

$\frac{V}{a}$ = An area needed for comfortable hiking (hikers/sqm)

R_f = Average time required for hikers to hike

2. Real Carrying Capacity (RCC)

The *Real Carrying Capacity (RCC)* is the number of visitors allowed to visit a tourist area, with a Correction factor (C_f) based on the area's characteristics applied to *PCC*. The correction factor is a reducing factor expressed in percentage:

$$RCC = PCC \times C_{f1} \times C_{f2} \times \dots \times C_{fn}$$

The slope correction factor ($C_{f_{slope}}$) is related to the difficulty of the hiking trail traversed by tourists based on the condition of the hiking trail's slope. The amount of $C_{f_{slope}}$ value is calculated by scoring the hiking trail based on the slope class with the criteria in Table 1. The calculation of the $C_{f_{slope}}$ value is measured in percentage form with the equation:

$$C_{f_{slope}} = \frac{(100\% \times l_1) + (80\% \times l_2) + (60\% \times l_3) + (40\% \times l_4) + (20\% \times l_5)}{l}$$

where,

$C_{f_{slope}}$ = The slope correction factor

l_n = The length of the hiking trail in the slope class n (meters)

l = The total of hiking trail (meters)

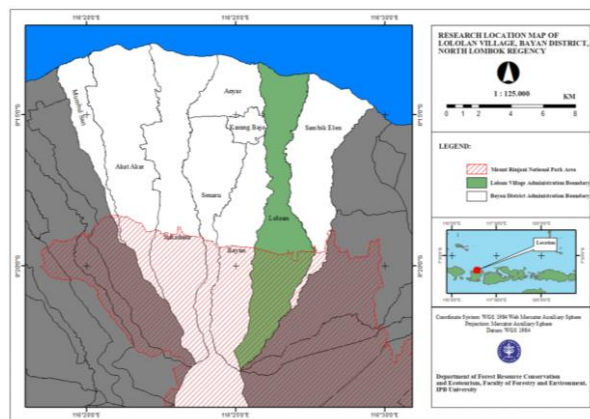


Fig. 1: Research map of the Torean hiking trail at Mount Rinjani National Park (TNGR)

Table 1: Weighting criteria for hiking trails based on land slope in the Torean hiking trail, Mount Rinjani National Park (TNGR)

No.	Slope classes (%)	Slope level	Weight value (%)
1	0-8	Flat	100
2	8-15	Gentle	80
3	15-25	Slight steep	60
4	25-45	Steep	40
5	>45	Very steep	20

Source: Minister of Agriculture decree No.837/Kpts/UM/11/1980

The rainfall correction factor ($C_{f_{rain}}$) uses the average number of rainy days with high rainfall (>300 mm) in 1 year for five years (2017-2021) as a parameter. The rainfall data was taken from three rain observation stations closest to the Torean hiking trail, namely Bayan Station, Sembalun Station, and Santong Station. $C_{f_{rain}}$ is calculated as follows:

$$C_{f_{rain}} = 1 - \frac{r_l}{r_t}$$

where,

- $C_{f_{rain}}$ = The rainfall correction factor
- r_l = The number of rainy days that limit visits in 1 year
- r_t = The number of days the hiking trail is open to the public in 1 year

Social correction factors ($C_{f_{social}}$) consider the number of visitors that can be accommodated in a tourist area with the imposition of the distance between visitors that prevents visitors from crowding. For hiking tourism, restrictions are calculated by determining the maximum number of tourists in one hiking group and the minimum distance between groups of hikers. $C_{f_{social}}$ is calculated by the equation of the maximum number of visitors with the imposition of distance divided by the physical carrying capacity:

$$C_{f_{social}} = \frac{S_m}{PCC}$$

where,

- $C_{f_{social}}$ = The social correction factor
- S_m = The maximum number of visitors with assigned distances (hiking activities or camping activities)
- PCC = The physical carrying capacity

3. Effective Carrying Capacity (ECC)

The Effective Carrying Capacity (ECC) is the maximum number of visits considering Management Capacity (MC). In this study, the MC value was calculated based on two management components: The condition of infrastructure and services to visitors. After scoring on the evaluation of conditions, the value of management ability is obtained from the average value of each variable with the formula:

$$MC = \frac{I + S}{2} \times 100$$

where,

- MC = The management capacity value
- I = The infrastructure facilities' value
- S = The service's value where provided to visitors

The equation for the calculation of the effective carrying capacity (ECC) is as follows:

$$ECC = RCC \times MC$$

where,

- ECC = The effective carrying capacity
- RCC = The real carrying capacity
- MC = The management capacity value

Results and Discussion

General Condition of the Torean Hiking Trail

The Torean hiking trail is one of the six hiking trails in Mount Rinjani National Park (TNGR). This hiking trail is located within the national park management section I area, precisely at the Senaru resort, administratively located in Loloan village, North Lombok regency, West Nusa Tenggara. The Torean hiking trail was inaugurated as the newest hiking trail and opened on April 1, 2021. Previously, the Torean hiking trail was a traditional trail used by the surrounding community to carry out religious activities and traditional ceremonies, one of which was the Mulang Pekelem ceremony. The Torean hiking trail has attracted various domestic and foreign tourists since its opening. As of May 31, 2022, as many as 24,273 tourists have passed the Torean hiking trail. A map of the Torean hiking trail can be seen in Fig. 2.

Physical Carrying Capacity (PCC)

The carrying capacity value for hiking activities is calculated based on the capacity of the hiking trail. In this study, the Torean hiking trail was calculated based on two versions, namely the old Torean hiking trail (the Torean hiking trail at the time of the study starting from the Torean post to the Sembalun-Torean junction) and the New Torean hiking trail (the Torean hiking trail based on the development plan to be realized, starting from Birisan Nangka to the Torean Sembalun junction). The following assumptions calculate the Physical Carrying Capacity (PCC) of the Torean hiking trail:

1. Hiking trails are used for 2-way tourist traffic
2. Based on a survey of hikers who have hiked the Torean hiking trail, the required area is 2 m² per tourist, so $V/a = 0.50$
3. The rotation factor is the turnover of visitors traveling, calculated by the operational time of the visit divided by the average time required to travel. In hiking tours in Mount Rinjani National Park (TNGR), the area is open for 24 h; therefore, the time of daylight is used as a parameter because the hike is carried out at noon, which is 12 h from 6 PM to 6 AM local time (UTC +08.00). The average time required to hike on the old Torean hiking trail based on the average time of researchers and hiker respondents is 14.74 h, while the average time required to hike on the New Torean hiking trail is 9.36 h, so the old Torean hiking trail $R_f = \frac{12}{14.74} = 0.81$; while RF New Torean hiking trail, $R_f = \frac{12}{9.36} = 1.28$

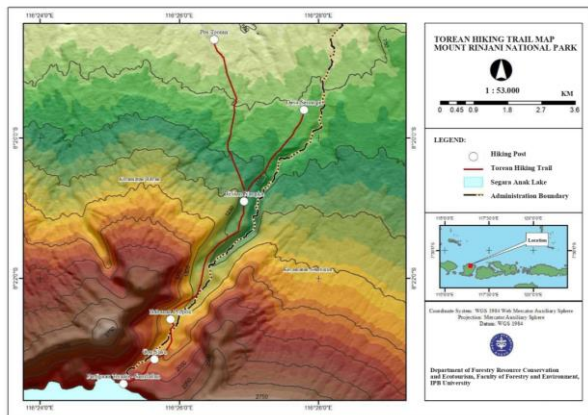


Fig. 2: Torean hiking trail map at Mount Rinjani National Park (TNGR)

Table 2: Physical Carrying Capacity (PCC) value at the Torean hiking trail, Mount Rinjani National Park (TNGR)

Hiking trail	Length (m)	R_f	$\frac{V}{a}$	PCC (people/day)
Old Torean hiking trail	11,149	0.81	0.50	4,516
New Torean hiking trail	6,507	1.28	1.28	4,165

Table 3: Scoring of the old Torean hiking trail by land slope class

Slope class (%)	Hiking track length per slope class (m)	Slope value
I (0-8)	1,003.41	1,003.41
II (8-15)	780.43	624.34
III (15-25)	1,114.90	668.94
IV (25-45)	2,898.74	1,159.50
V (>45)	5,351.52	1,070.30
Total	11,149.00	4,526.49

Table 4: Scoring of the New Torean hiking trail by land slope class

Slope class (%)	Hiking track length per slope class (m)	Slope value
I (0-8)	780.84	780.84
II (8-15)	650.70	520.56
III (15-25)	845.91	507.55
IV (25-45)	1,626.75	650.70
V (>45)	2,602.80	520.56
Total	6,507	2,980.20

Based on Table 2, the 11,149-meter-long old Torean hiking trail has a PCC of 4,516 people/day, while the 6,507-meter-long new Torean hiking trail has a PCC of 4,165 people/day. The shorter trail length on the new Torean hiking trail causes its PCC value to be smaller than that of the old Torean hiking trail.

Real Carrying Capacity (RCC)

The value of RCC is calculated based on the value of PCC, considering the correction factor percentage on the hiking trail:

1. Slope correction factor ($C_{f_{slope}}$)

Based on Table 3, the old Torean hiking trail has varying slope classes; the slope value of the hiking trail is 4,526.49, therefore the old Torean hiking trail $C_{f_{slope}} = \frac{4,526.49}{11,149} = 0.41$. In Table 4, the new Torean hiking trail's slope value is 2,980.2; therefore, the New Torean hiking trail, $C_{f_{slope}} = \frac{2,980.2}{6,507} = 0.46$. Both $C_{f_{slope}}$ are below 0.50, meaning they significantly reduce more than half the PCC value. This happened because more than 75% of the hiking trail has a slope with a moderately steep to very steep level range.

2. Rainfall correction factor ($C_{f_{rain}}$)

The calculation of the $C_{f_{rain}}$ value is based on the number of average rainy days over nine months (April-December), adjusting to the hiking period for tourists divided by the number of days in the period. Based on Indonesia's meteorology, climatology, and geophysical agency (Badan Meteorologi, Klimatologi, dan Geofisika in the Indonesian language, hereafter BMKG) data, it is known that for 2017-2021, six months in the April-December range have an average monthly rainfall above 300 mm, so the calculation of the correction factor ($C_{f_{rain}}$) value is as follows:

$$C_{f_{rain}} = 1 - \frac{6 \text{ months} \times 30 \text{ days}}{(365 - 90) \text{ days} \times 5 \text{ years}}$$

$$= 1 - \left(\frac{180}{1,375} \right) = 0.87$$

The $C_{f_{rain}}$ value did not significantly impact the RCC because the Mount Rinjani National Park Center (BTNGR) did not close the hiking trail due to rain in the month of the opening of hiking tours. Mount Rinjani National Park (TNGR) routinely conducts hiking trail closures from January 1 to March 31 of each year due to high rainfall and ecosystem recovery considerations. Hiking trail closure due to rainfall in the operational month of hiking activities (April-December) is only carried out in case of heavy rainfall (>300 mm). High rainfall increases the level of danger on the hiking trail as it increases the volume of sludge that can cause hikers to slip and fall (Muntasib *et al.*, 2019).

3. Social correction factors ($C_{f_{social}}$)

The following calculations calculate social correction factors:

- One ideal hiking group is 9 people, the distance between individuals in the group is 2 m and the minimum distance between groups of hikers is 50 m, so the distance required per group is (9 people \times 2 m) + 50 = 68 m

- b) The Number of Groups (NG) that the track can accommodate is calculated by dividing the total length of the track by the required distance/group, so that the number of groups at the old Torean hiking trail is $NG = \frac{11,149}{68} = 164 \text{ groups}$, while the number of group at the new Torean hiking trail is $NG = \frac{6,507}{68} = 96 \text{ groups}$
- c) Based on these calculations, the visitors whom the Old Torean hiking trail can accommodate with restrictions are $164 \times 9 \text{ people} = 1,476 \text{ people}$, while the visitors that the New Torean hiking trail can accommodate with restrictions are $96 \times 9 \text{ people} = 864 \text{ people}$
- d) The social correction factor is calculated by dividing the maximum visitors with physical restrictions and carrying capacity, therefore old Torean hiking trail $C_{f_{social}} = \frac{1,476}{4,516} = 0.33$; and the new Torean hiking trail $C_{f_{social}} = \frac{864}{4,165} = 0.20$

The social correction factor is the correction factor with the most impact in reducing the value of PCC. The enforcement of distancing with the provisions mentioned causes only 20-33% of visitors to be accommodated in the physical carrying capacity of the Torean hiking trail. In other studies, social correction factors often have the most significant impact on calculating RCC. The research of Queiroz *et al.* (2014) has the most significant $C_{f_{social}}$ value, which is 0.057. The same thing was also found in Maldonado and Montagnini's (2005) study, which had a $C_{f_{social}}$ value of 0.23.

After all the variables of the correction factor have been known, the RCC value is calculated by multiplying the PCC by all correction factors, as shown in Table 5. The old Torean hiking trail has an RCC value of 532 people/day, while the new Torean hiking trail has an RCC value of 333 people/day. The analysis results show that the value of RCC is much smaller than the PCC. Correction factors strongly influence the value of carrying capacity. This shows that although the Torean hiking trail can physically accommodate a high number of tourists, in reality, by considering environmental conditions and visitor comfort, the value of its carrying capacity will be much reduced.

Effective Carrying Capacity (ECC)

The ECC value is calculated by considering the Management Capacity (MC) owned by the area manager. Based on Table 6, it can be seen that the management of the Torean hiking trail obtained a score of 762 in the aspect of visitor services and a score of 719 in the aspect of infrastructure so $MC = \frac{(762+719)}{2} = 1,050$ = 0.70. Once the MC value is known, the ECC value of the Torean hiking trail can be calculated by multiplying the MC by the RCC, as listed in Table 7.

Table 5: Results of the analysis of the real carrying capacity values of the Torean hiking trail, Mount Rinjani National Park (TNGR)

Hiking trail	PCC (people/day)	Correction factors			RCC (people/day)
		$C_{f_{slope}}$	$C_{f_{rain}}$	$C_{f_{social}}$	
Old Torean hiking trail	4,516	0.41	0.87	0.33	532
New Torean hiking trail	4,165	0.46	0.87	0.20	333

Table 6: Hiker's assessment of visitor services and infrastructure on the Torean hiking trail, Mount Rinjani National Park (TNGR)

Management capacity (MC) component	Aspects	Score (n/150)	Total Score		
Visitor Services (S)	Visitor inspection	106	762		
	eRinjani application	109			
	Insurance	107			
	Track organizer	107			
	Guide	108			
	Porter	114			
	Evacuation services	111			
	Infrastructure (I)	Information center		109	719
		Hiking trail		110	
		Information and directions boards		100	
Campground area		104			
Water source		112			
Shelter		98			
	Toilet	86			

Table 7: Calculation of the Effective Carrying Capacity (ECC) values of the Torean hiking trail

Hiking trail	PCC (people/day)	RCC (people/day)	MC	ECC (people/day)
Old Torean hiking trail	4516	532	0.7	372
New Torean hiking trail	4165	333	0.7	233

The ECC on the old Torean hiking trail is 372 people/day, while the new Torean hiking trail has an ECC of 233 people/day. Compared to the carrying capacity of the Torean hiking trail, the carrying capacity of the Sembalun-Senaru hiking trails has a greater ECC value, which is 846 and 628 people/day (Raytodi *et al.*, 2020). The MC value on the Sembalun-Senaru hiking trail is similar to the MC value of the Torean hiking trail, which is 0.76. However, the difference in the results of the calculation of carrying capacity is caused by other factors, one of which is that previous studies used the assumption that the area used by one tourist is 1 m²; hence both tracks have a higher PCC value. In addition, previous studies used whole Mount Rinjani National Park (TNGR) area slope data rather than the hiking trail slope: therefore, it had a higher $C_{f_{slope}}$ value.

Carrying Capacity as Torean Track Visitor Quota Input

The carrying capacity cannot be separated from the use limit decision because they are linked. If one could establish a carrying capacity, that capacity has meaning

only if managers have the political will and ability to develop mechanisms to limit tourist use (McCool and Lime, 2001). The carrying capacity data can be used to set a daily hiking quota. Based on the Mount Rinjani National Park (TNGR) Hiking SOP, one ideal hiking group consists of six hikers, one guide accompanying a maximum of six hikers, and one porter serving a maximum of three hikers. The details of the distribution of the hiking track user composition are as follows:

1. Old Torean can accommodate 372 people per day, with details of 248 hikers, 41 guides, and 93 porters
2. New Torean can accommodate 233 people per day, with details of 155 hikers, 26 guides, and 52 porters

The Sembalun, Senaru, and Torean hiking trails are inter-connected, so hikers hiking on other trails can descend through the Torean hiking trail and vice versa. Therefore, the calculation of visitor quotas needs to consider hikers entering and exiting at the Torean hiking trail gate. It would be better if the registration system could detect and count the number of hikers going up and down on a particular day. This improvement will increase the accuracy of implementing visitor quotas according to the carrying capacity of the hiking trail.

Comparison of Tourist Visitation Level with Carrying Capacity of Torean Hiking Trail

Based on tourist visit data in Table 8, the Torean hiking trail managed to attract 18,818 tourists in its first year of opening as an official hiking track. The Torean hiking trail is more desirable for hikers to hike down the mountain than to go uphill. This is evidenced by visitor check-out data which shows as many as 15,678 hikers have exited through the Torean hiking trail throughout 2021. This number is five times higher than the number of hikers entering or checking in at the gates of the Torean hiking trail, which is only 3,140 hikers.

Table 8: Torean hiking trail visit data in 2021 at Mount Rinjani National Park (TNGR)

Month	Check-in (people)	Check-out (people)	Check-out (people)
April	133	631	764
May	429	1,831	2,260
June	704	3,193	3,897
July	502	2,260	2,762
August	427	2,526	2,953
September	290	1,504	1,794
October	317	1,556	1,873
November	141	597	738
December	197	1,580	1,777
Total	3,140	15,678	18,818

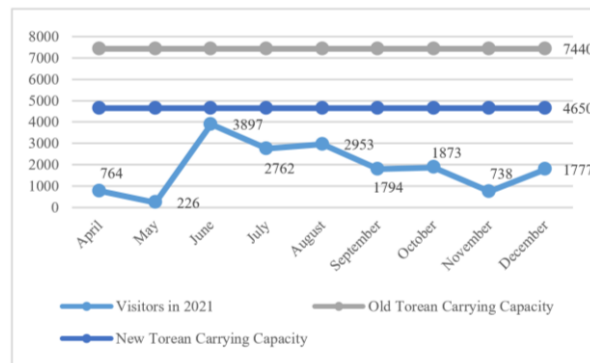


Fig. 3: Comparison between the number of tourist visits and the carrying capacity on the Torean hiking trail in 2021

The increasing popularity of the Torean hiking trail as one of the hiking trails in Mount Rinjani National Park (TNGR) needs to pay attention to the carrying capacity value. The number of visits that exceed the carrying capacity will decrease the quality of the tourist area, reduce the comfort of visitors, and even endanger visitors' safety. Therefore, it is necessary to compare the number of visits on the old Torean and new Torean hiking trails with their carrying capacity, as shown in Fig. 3.

The graph in Fig. 3 does not show any visits exceeding the Torean hiking trail's carrying capacity limit, even at the highest visit in June. Therefore, it can be concluded that in 2021 there are no visits that exceed the carrying capacity of the hiking trail and there is no indication of overtourism in terms of the number of visitors on the Torean hiking trail. Hiking tourism visits in Mount Rinjani National Park (TNGR) during 2021 are within the period of enforcing the visitor quota of a maximum of 50% of the usual visit quota. The visit quota increased to 75% when it reopened in 2022 and back to 100% of the regular visit quota as of July 27, 2022. Enacting a regular visit quota requires more supervision in visitor registration so that no visits exceed the limit of the visit quota and the carrying capacity of the hiking trail.

Conclusion

The Physical Carrying Capacity (PCC) of the old Torean hiking trail (Torean Post-Sembalun Torean Junction) is 4,516 people/day, while the New Torean hiking trail (Birisan Nangka Sembalun Torean Junction) has a Physical Carrying Capacity (PCC) of 4,165 people/day. The Real Carrying Capacity (RCC) of the Old Torean hiking trail is 532 people/day, while the New Torean hiking trail has a Real Carrying Capacity (RCC) of 333 people/day. The Effective Carrying Capacity (ECC) of the Old Torean hiking trail is 372 people/day, while the new Torean hiking trail has an Effective Carrying Capacity (ECC) of 233 people/day. The value of carrying capacity is higher than the level of visits; therefore, tourism

activities on the Torean hiking trail are not indicated as over-tourism in terms of the number of visits.

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Author's Contributions

Endang Koestati Sri Harini Muntasib: Conceptualization, methodology, supervision, written reviewed and edited. **Singgih Ali Nurdin:** Data collection, software, data visualization, written original drafted preparation.

Anggit Haryoso: Supervision, methodology, written reviewed and edited.

Ethics

The study does not pose a conflict of interest.

References

- Cifuentes, M. (1992). *Determinación de capacidad de carga turística en áreas protegidas*. CATIE, Programa de Manejo Integrado de Recursos Naturales. pp: 28. ISBN-10: 9789977571294.
- Maldonado, E., & Montagnini, F. (2005). Carrying Capacity of La Tigra National Park, Honduras. *Journal of Sustainable Forestry*, 19(4), 29–48. https://doi.org/10.1300/j091v19n04_03
- Martin, B. S., & Uysal, M. (1990). An examination of the relationship between carrying capacity and the tourism lifecycle: Management and policy implications. *Journal of Environmental Management*, 31(4), 327–333. [https://doi.org/10.1016/s0301-4797\(05\)80061-1](https://doi.org/10.1016/s0301-4797(05)80061-1)
- McCool, S. F., & Lime, D. W. (2001). Tourism Carrying Capacity: Tempting Fantasy or Useful Reality? *Journal of Sustainable Tourism*, 9(5), 372–388. <https://doi.org/10.1080/09669580108667409>
- Muntasib, E. K. S. H., Nadhira, F., & Meilani, R. (2019). Hazard Management in Tourism: A Case Study of The Senaru-Sembalun Hiking Trail, Mount Rinjani National Park, Indonesia. *Jurnal Manajemen Hutan Tropika*, 25(3), 199–208. <https://doi.org/10.7226/jtjm.25.3.199>
- Raytodi, A. R., Nisa, K., & Asyasyifa. (2020). Studi jalur pendakian senaru dan sembalun taman nasional gunung rinjani provinsi nusa tenggara barat. *Jurnal Sylva Scientiae*, 3(5), 783–795. <https://doi.org/10.20527/jss.v3i5.2527>
- Rosenow, J. E., & Pulsipher, G. L. (1979). *Tourism, the Good, the Bad and the Ugly*. Century Three Press. pp: 264. ISBN-10: 9780933400443.
- UNWTO. (1981). *Saturation of Tourist Destinations: Report of the Secretary General* (United Nations World Tourism Organization). World Tourism Organization: Madrid.
- UNWTO. (2018). *Overtourism? – Understanding and Managing Urban Tourism Growth beyond Perceptions, Executive Summary*. World Tourism Organization: Madrid. <https://doi.org/10.18111/9789284419999>