



Using Social Carrying Capacity for Ecotourism Planning: A Case of Mt. Pulag National Park, Philippines

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Abstract

This study explores the concept of social carrying capacity as a tool for ecotourism planning, focusing on Mt. Pulag National Park, a protected area in the Philippines experiencing rapid tourism growth. The study explores how visitors' perception of crowding affects satisfaction and, in turn, the sustainability of ecotourism activities. Using a descriptive research design and an online survey, the study evaluated 416 climbers of Mt. Pulag and analyzed motivations, crowding perceptions, and quality of experience.

Spearman correlation analysis revealed that the importance of physical activity ($\rho = .121$, $p = .013$) and solitude ($\rho = .094$, $p = .056$) were associated with sensitivity to crowding at the Visitor's Center. At the same time, personal/adventure showed a weak inverse relationship with crowding at campsites ($\rho = -.083$, $p = .090$). Overall experience was positively associated with motivations such as physical activity ($\rho = .188$, $p < .001$), solitude ($\rho = .156$, $p = .001$), culture ($\rho = .283$, $p < .001$), and the desire for recharge or inspiration ($\rho = .208$, $p = .001$).

Regression analysis identified recharge/inspiration, personal/adventure, and culture as significant factors associated with Overall Experience, as well as the degree of Bothersome to Crowdedness and observed negative observations within the national park ($r^2 = 0.21$, $p = .000$). These findings suggest that purpose-driven motivations influence both crowding perception and visitor satisfaction.

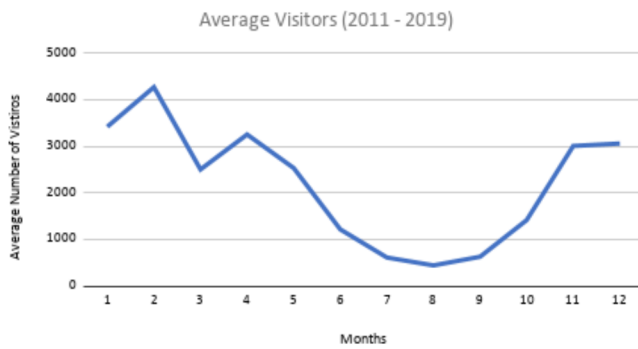
Although the regression models explained a modest proportion of the variance ($r^2 = 0.21$), the results align with other studies that use ordinal perception data to inform threshold-setting and visitor management. The study recommends integrating visitor motivation data into protected area management plans to enhance satisfaction while supporting long-term environmental sustainability.

Keywords: social carrying capacity, protected areas, Mt. Pulag, overcrowding, sustainable development goals

1. Introduction

Ecotourism plays an essential role in the protection and sustainable use of natural areas, particularly in countries like the Philippines, which are home to globally significant biodiversity. If tourism is not managed well, it can harm delicate ecosystems, which

makes the visitor experience less enjoyable, and even unravel the social and cultural ties within local communities. This is best observed in one of the most visited protected areas in the Philippines – Mount Pulag National Park (MPNP) – which has witnessed a steady increase in visitor numbers over the past decades (see Figure 1 below).



Source: PAMO (2020)

Figure 1. Average Visitors (2011 – 2019)

Visitors are drawn to the renowned “Sea of Clouds” of Mt. Pulag (a visually stunning phenomenon where clouds form dense blankets below the mountain peaks, creating the illusion of standing above the clouds), which normally occurs during the cold months of December to February.

Unfortunately, this “peak season” is exactly when congestion at key recreational sites has become a frequent occurrence, resulting in complaints of overcrowding and reduced visitor satisfaction. Some climbers have colloquially referred to the situation as a “sea of crowds,” highlighting the sharp contrast between their expectations of solitude and the actual visitor conditions at the summit.

This unregulated surge in visitors poses a double threat for Mt. Pulag. On the one hand, it accelerates ecological damage through soil erosion, waste accumulation, and habitat disturbance. On the other hand, it affects the social dimension of tourism by diminishing the recreational experiences visitors seek, such as solitude, connection with nature, and spiritual renewal. While previous studies have examined how much the environment can physically handle (i.e., ecological carrying capacity), this study focuses on the social carrying capacity – defined as the maximum number of visitors who can use a site without a decline in the quality of the experience or an impact on the well-being of host communities. It is about finding the sweet spot where everyone – and everything – thrives.

This paper explores the potential of social carrying capacity as a decision-support tool for ecotourism planning in protected areas. By focusing on Mt. Pulag, this study explores how visitors perceive crowding and how this affects their quality of experience. The aim is to use these insights to develop visitor management plans that support both conservation and sustainable tourism for the long term.

2. Research Objectives

This study aims to: (a) determine the perceived social carrying capacity at key recreational sites within Mount Pulag National Park; (b) analyze the relationship between visitor motivations, perceived crowding, and quality of experience; and (c) recommend visitor management strategies by integrating social carrying capacity into the ecotourism planning of protected areas.

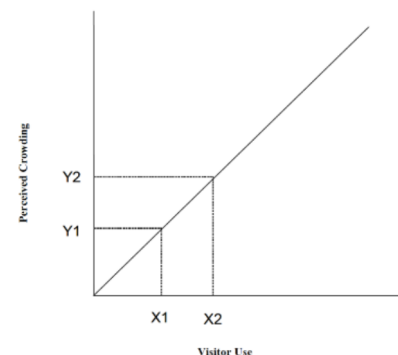
3. Literature Review and Background of the Study

The Philippines is internationally recognized as a biodiversity hotspot, being one of the 17 megadiverse countries that host the world’s richest biological resources (BMB, 2019).

Mount Pulag National Park (MPNP), Luzon’s highest peak, perfectly showcases this natural richness. On top of that, it is a prime ecotourism spot, famous for its breathtaking “sea of clouds,” enchanting mossy forests, and remarkable hiking trails.

The concept of carrying capacity has long been used as a planning and management tool to regulate human use of fragile environments. As discussed by Coccossis and Mexa (2004), tourism carrying capacity includes not only ecological thresholds but socio-cultural and experiential dimensions that influence sustainable use of destinations. Initially focused on ecological thresholds, it has since expanded to encompass social carrying capacity – the maximum number of visitors a site can accommodate without deteriorating visitor satisfaction or violating social norms of acceptability (Watson, 1988; Manning, 2002; Pulido-Fernandez et al., 2025).

Manning (2002) further illustrates this concept through a graphical model showing how increases in visitor use correspond to heightened perceptions of crowding (see Figure 2).



Source: Manning (2002)

Figure 2. Perception of Crowding

In this model, on the x-axis, visitor use is positively correlated with perceived crowding on the y-axis. However, the slope and thresholds may vary depending on visitors' expectations and environmental context. For example, at use level X1, crowding perception is relatively low (Y1), but as use intensifies to X2, perceived crowding rises to Y2. This framework supports the inclusion of subjective visitor perceptions in determining social carrying capacity thresholds. This reinforces the importance of perceptual data in planning for protected areas like Mt. Pulag. Social carrying capacity treats crowding as a subjective phenomenon shaped by individuals' expectations, values, and motivations for visiting a site (Vaske & Shelby, 2008).

Numerous studies have shown that visitor experience is influenced not just by the physical density of people in space, but by the psychological interpretation of the density – i.e., whether it “feels crowded.” This is particularly true in natural areas where recreational experiences are linked to solitude, peace, and connection with nature (Manning, 2011; Asan & Emeksiz, 2018). When visitor numbers exceed a certain perceptual threshold, the result is a degradation in the overall quality of experience (Seidl & Tisdell, 1999).

In the case of MPNP, the Department of Environment and Natural Resources (DENR) had earlier estimated a physical carrying capacity of 11,055 visitors per annum for the summit area, based on Boullon's formula. However, in 2019 alone, the park received 43,229 visitors – a 2,093% increase from 2001, clearly surpassing the threshold calculated by the Department (DENR-PAMO, 2020). More than just the high visitor count, the sense of overcrowding at campsites, on trails, and at the summit has led to a lot of dissatisfaction and complaints, especially on weekends and holidays. This underscores the need to incorporate social carrying capacity metrics into visitor use management frameworks.

In recent years, a more adaptive and visitor-centered approach to managing protected areas has gained traction. This involves incorporating factors like why people visit, what they expect, and how much crowding they can tolerate (Pulido-Fernandez et al., 2025; Eagles et al., 2002).

In the Philippines, the use of perceptual indicators as a basis for visitor management is supported by Philippine environmental policy, particularly in DENR Administrative Order No. 2013-19 and DENR

Memorandum Circular No. 2021-02, which mandate the inclusion of carrying capacity assessments in Protected Area Management Plans (PAMPs).

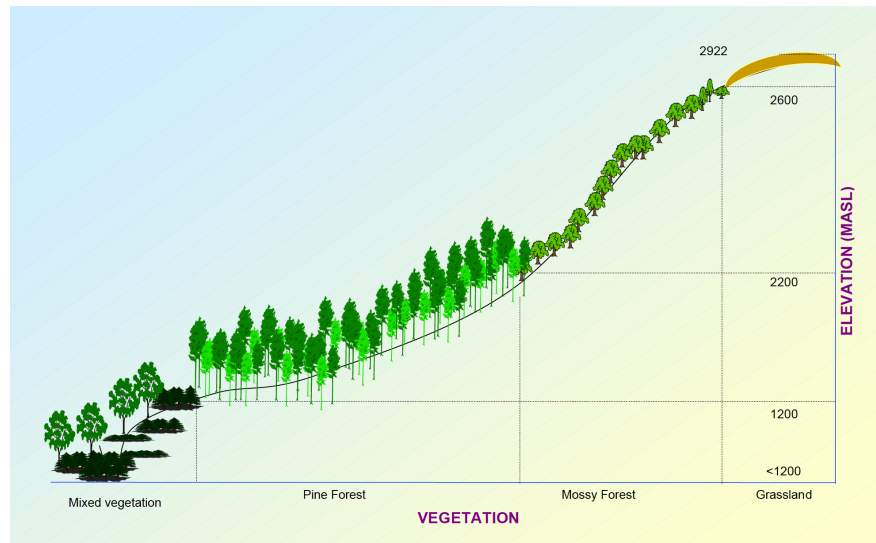
Previous studies in the Philippines concerning protected areas have largely concentrated on ecological or biophysical limits. However, there has been limited research specifically exploring social carrying capacity through visitor perceptions and site-specific thresholds. This study addresses that gap by providing empirical data on crowding perceptions and acceptable visitor levels across multiple recreational sites within Mt. Pulag National Park.

4. Study Area

Nestled within the Cordillera Mountain range, Mt. Pulag National Park stands as Luzon's tallest peak, reaching an elevation of 2,922 meters above sea level. It covers a vast area within the Cordillera Administrative Region (Benguet Province: Municipalities of Buguias, Kabayan, and Bukod; Ifugao Province: Municipality of Tinoc) and Region 2 (Province of Nueva Vizcaya: Municipality of Kayapa). Mount Pulag was originally part of the Central Cordillera Forest Reserve, which was established under Proclamation No. 217. Through the years, the coverage of the Central Cordillera Forest Reserve was reduced through various enactments for human settlements, watershed reservations, and other purposes. Eventually, Mount Pulog (as locals traditionally called it) was declared as Mt. Pulag National Park under Proclamation No. 75, issued on 20 February 1987. It is listed under the National Integrated Protected Areas System (NIPAS) under Republic Act No. 7586, which was further amended by Republic Act No. 11038.

Mt. Pulag boasts a diverse array of ecosystems, each shaped by its elevation. It starts with mixed vegetation below 1,200 meters above sea level, transitioning into pine forests, then mossy forests, and finally alpine grasslands at the summit. These distinct zones contribute to the park's rich ecology and truly shape what visitors experience as they hike its main trails. For a clearer picture, Figure 3 illustrates MPNP's altitudinal profile, highlighting these unique shifts in vegetation from base to peak.

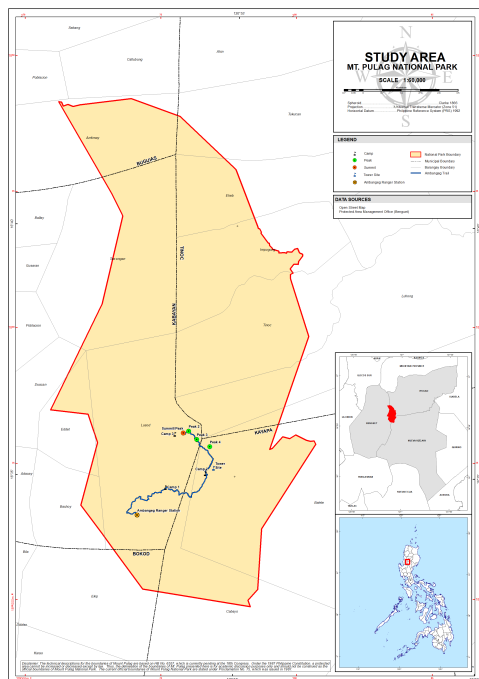
Furthermore, Mt. Pulag is included in the Philippines' Key Biodiversity Area (KBA) inventory because of the presence of globally threatened species and its unique habitats.



Source: DENR-NIPAP - General Management Plan, 2000; FASPSLIB Database, DENR, 2020

Figure 3. Altitudinal Profile of MPNP

The study area within MPNP focuses on zones designated for recreational use, particularly along the Ambangeg Trail – the easiest and most frequented route to the summit. Key areas include: (a) Trails – with access via Ambangeg, Akiki, Tawangan, and Ambaguio Trails; (b) Campsites – three designated areas named Camps 1 to 3; and (c) Summit Viewing Sites – Peaks 1 to 4 and the Tower Site, popular among visitors for viewing the “Sea of Clouds” at sunrise (see Figure 4).



Source: Base map and trail data – OpenStreetMap.org; MPNP boundary –House Bill No. 6557; Campsites, summit, and Peaks location –MPNP PAMO, 2020

Figure 4. Study Area

5. Methodology

This study adopted a quantitative case study approach to determine the social carrying capacity of Mount Pulag National Park. The methodology focused on analyzing climbers’ motivations, perceptions of crowding, and overall quality of experience at various recreational sites within the park. The approach was designed to generate empirical data that can be utilized for ecotourism management strategies for the protected area.

5.1 Study Design and Data Collection

Quantitative data were gathered through an online survey. Due to mobility restrictions and evolving safety protocols at the time of the study (COVID pandemic), data collection was conducted via online channels. Respondents were identified using systematic purposive sampling, focusing on Filipino recreational tourists who had climbed Mount Pulag within the last three to five years. Potential respondents were identified through Instagram, specifically those who posted images tagged with hashtags such as #mtpulag, #pulag, and related variations. An invitation to participate in the survey was distributed via direct messages on Instagram containing a link to a structured Google Form.

The survey incorporated screening questions to ensure participation was limited to Filipino citizens aged 18 and above who had previously visited MPNP. Foreign nationals were excluded from the sample, as prior studies indicate that they exhibit differing perceptions of crowding (Hall, 1966; Kreuz & Roberts, 2019).

A total of 416 responses were collected and analyzed.

5.2 Measurement Tools and Indicators

The survey instrument was divided into five parts:

1. Demographic Profile - age, gender, residence, and frequency of visits.
2. Motivations for Visit - rated using a 5-point Likert scale adapted from Schreyer and Roggenbuck (1978).
3. Perception of Crowding – assessed through respondents' subjective evaluations using a 10-point evaluation scale.
4. Botheredness Index - a perception-based metric to assess the discomfort felt in crowded settings.
5. Overall Quality of Experience - measured through satisfaction ratings and likelihood of return.

Motivational questions were drawn from well-regarded recreational studies (Asan & Emeksiz, 2018; Manning, 2011) and pretested to ensure clarity and relevance. Each site within MPNP (trails, campsites, and summit peaks) was evaluated for perceived density, experience quality, and crowding impact.

5.3 Sample Size and Statistical Design

Using Cochran's (1977) formula (as cited in Bartlett et al., 2001), a minimum sample size was calculated under the following assumptions: 95% confidence level, 5% margin of error, and maximum variance ($p = 0.5$). Given a 2019 visitor population of 43,229, the computed sample size was 381, adjusted to 190 after applying a design effect of 0.5 due to the non-probabilistic sampling design.

Data were encoded into Excel and analyzed using SPSS. Descriptive statistics included mean, frequency, and standard deviation. Spearman correlation analysis and multiple linear regression were employed to examine the relationships between visitor motivations and perceptions of crowding, and quality of experience.

5.4 Ethical Considerations

Participation in the survey was voluntary. Respondents were informed of the study's purpose and assured of anonymity. All data were stored securely and used solely for academic research.

6. Results and Discussion

6.1 Visitor Demographics

A total of 416 respondents participated in the survey. The majority were male (57.7%), while females comprised 42.3% of the sample. Most of the visitors fell within the 25 to 34 age group (65.4%), followed by those aged 35 to 44 (15.9%) and 18 to 24 (9.6%), while the rest were from the 45 to 64 age group (9.2%). In terms of educational attainment, a significant majority (79.8%) were college graduates, with 16.6% holding post-graduate degrees. All respondents are Filipinos. In terms of monthly income, the largest share (36.5%) reported earning between Php25,000 and Php50,000, followed by those earning below Php25,000 (30.3%) and those earning Php50,000 to Php75,000 (13.7%).

In essence, the demographic profile of Mt. Pulag visitors reveals a predominantly young, educated, and Filipino cohort (65% aged 25-34; 80% college graduates), with modest to middle incomes. This is the age group often associated with people who are averse or inclined to nature-based recreational activities (Ng, S.-L. et al., 2024). The slight male majority (57.7%) may reflect broader trends in mountaineering participation; however, the strong female representation (42.3%) suggests that Mt. Pulag appeals to a diverse audience. The demographic context aligns with motivations centered on nature connection, solitude, and personal renewal, which, as shown later in the analysis, correlate with lower crowding tolerance and higher sensitivity to environmental degradation.

6.2 Visit Characteristics, Visitor Frequency and Variations in Visits

Out of the 416 respondents, 257 (61.8%) were first-time visitors, while 154 (37%) had visited more than once, and only 5 (1.2%) identified themselves as frequent climbers. Most visitors (311, 74.8%) went on multi-day climbs, while 105 respondents (25.2%) were day-trippers. Most visitors came in groups (87.3%), with only a few hiking alone (1.2%) or with a partner (11.5%). In terms of timing, most visitations peaked in February (100 visitors), January (55 visitors), and December (45 visitors), coinciding with the Amihan season and the "sea of clouds" phenomenon. The most-used trail is the easily accessible Ambangeg Trail (68.5%), followed by the Akiki Trail (25.7%). Ambaguio and Tawagangan were less frequented by the visitors.

The overall average number of visits among the respondents was 3 visits ($SD = 6.7$). Those who had visited more than once reported an average of 5 visits ($SD = 9.5$). Frequent visitors averaged 4 visits ($SD = 1.3$). Multi-day visitors had a higher average number of visits (4 visits, $SD = 7.7$) than day trippers (2 visits, $SD = 1.4$). Those who visited alone or with a partner averaged only 2 visits, whereas those who visited in groups showed greater variability.

By month, the highest average number of visits occurred in December (5 visits, standard deviation = 14.4). In contrast, months like August and June had

the lowest average visits (1-2) and minimal variation, suggesting off-peak periods.

6.3 Objective 1: Determine the Perceived Social Carrying Capacity of Recreational Sites in MPNP

Visitors were asked to estimate the number of people they considered acceptable at various locations within the park before the experience would feel “crowded.” Table 1 below represents the average acceptable visitor counts as perceived by respondents for each study area.

Sites	Average Acceptable Number of People	Standard Deviaton	Minimum	Maximum	Carrying Capacity Estimate Per Day by DENR-ERDS ^a /PASu ^b
Camp 1	32.66	37.50	1	500	-
Camp 2	30.97	24.82	1	200	443 ^a
Camp 3	30.26	24.71	1	200	642 ^a
Summit (Peak 1)	46.16	30.04	1	202	77 ^a or 120 ^b
Peak 2	42.26	25.71	1	150	100 ^b
Peak 3	42.22	26.44	5	201	100 ^b
Peak 4	35.45	20.78	1	150	80 ^b
Tower Site	42.19	25.38	3	150	100 ^b

Note: ^a - The carrying capacity computation was done by DENR-ERDS

^b - The carrying capacity limit was provided by PASu Albas

Table 1. Thresholds per Study Area

These values represent the perceived social carrying capacity. Beyond these thresholds, the quality of experience declines significantly, as supported by survey responses and interviews with park management staff. Notably, perceived crowding was most acute at the summit, particularly during sunrise treks on weekends and holidays.

6.4 Objective 2: Analyze the Relationship Between Visitor Motivations, Perception of Crowding, and Quality of Experience

The top three purposes rated most important by respondents were connection with the natural environment ($mean = 4.9$, $s = 0.3$), recharge/inspiration/escape ($mean = 4.8$, $s = 0.5$), and personal/adventure ($mean = 4.7$, $s = 0.7$). In contrast, research was rated as the least important ($mean = 3.4$, $s = 1.4$), followed by social connection ($mean = 4.2$, $s = 1.0$). The overall average importance across all motivations was 4.4, which suggests that respondents give more importance to intrinsic and nature-based reasons for visiting Mt. Pulag.

In terms of differences in visitor motivation by demographics, across all segments, the most important purpose of visit was connection with the natural environment ($mean = 4.9$) across gender, age, education, and income groups. This was followed by recharge/inspiration/escape and personal/adventure, both scoring 4.7 – 4.8 overall.

It is also noteworthy that the younger visitors (18-24) rated solitude (4.8) and personal adventure (4.8) slightly higher than older age groups. Post-graduate respondents rated most purposes slightly higher than the average, especially culture (4.9) and solitude (4.8), while those with only a high school education still rated recharge and personal adventure at 5.0. Overall, the motivational ratings were consistently high ($mean = 4.4$), indicating that visitors across all backgrounds share strong nature- and purpose-driven reasons for visiting Mt. Pulag, with only research consistently scoring lower ($mean = 3.4$).

In terms of visitor motivations by trip profile and time, across all groups, visitors consistently rated connection with the natural environment ($mean = 4.9$) and recharge/inspiration/escape ($mean = 4.8$) as the most important reasons for visiting Mt. Pulag. These top motivations remained steady regardless of visit frequency (i.e., first-timers to frequent visitors), type of trip (i.e., day or multi-day), or companionship (i.e., alone, with a group, or with a partner). Visitors who traveled alone or identified as frequent climbers gave a high score (5.0) for motivations such as solitude, inspiration, and personal adventure, which suggest that they seek deeper, more introspective reasons for coming back.

Motivational scores were also consistent across months, with slight increases in December for physical activity (4.7) and personal challenge (4.8), coinciding with peak season. Overall, the data confirms a clear trend: Mt. Pulag visitors are strongly motivated by nature-based, personal, and restorative goals, with minimal variation across all visitor types or visit conditions. Academic or research-related purposes consistently received the lowest importance ($mean = 3.4$).

Table 1 also presents the average desired number of people per site as reported by respondents compared with the carrying capacity limits set by DENR-ERDS and PASu. For instance, in Camp 2, the estimated carrying capacity is 443 visitors/day, while respondents indicated an average acceptable group size of only 30.97 (standard deviation = 24.82). Similar disparities are observed in other sites such as Camp 3 (30.26 vs. 642/day) and Summit/Peak 1 (46.16 vs. 77 or 120/day). These findings underscore a critical gap between official capacity limits and perceived crowding thresholds by climbers.

To better understand how motivations influence perception of crowding, a Spearman's Rho correlation analysis ($n = 416$) was conducted (see Appendix A). The analysis revealed significant associations between visitor motivations and their perception of crowding. More specifically, it was observed that:

1. Visitors who prioritized physical activity showed higher sensitivity to crowding at the Visitor's Center ($p = .121$, $p = .013$) and also reported better overall experience ($p = .188$, $p < .001$).
2. Those motivated by solitude also tended to be more bothered by crowding ($p = .094$, $p = .056$), which is also significant at the .10 threshold.
3. There is an inverse relationship between the importance of personal/adventure experiences

and perceived crowding at campsites ($p = -.083$, $p = .090$).

4. All motivational variables – including culture ($p = .283$, $p < .001$), recharge/inspiration ($p = .208$, $p < .001$), and mountaineering skills ($p = .253$, $p < .001$) – were significantly and positively correlated with overall visitor experience.

These findings validate Manning's (2002) model, which shows a direct relationship between actual use levels and perceived crowding. They also reinforce Discrepancy Theory, in which the quality of experience is assessed against expected motivational fulfillment (Schreyer & Roggenbuck, 1978).

Checking the cause-and-effect relationship of eight motivation indicators to the overall experience generated about 8% r^2 , or coefficient of determination, and a p-value of the F-test of .000. This means that though the model is fit, only about 8% of the average variability of the overall experience of the visit can be explained by the eight motivation indicators. This model also reveals that, among the motivation indicators, only Recharge/inspiration/escape, Personal/Adventure, and **Culture** can significantly predict the rating of **Overall Experience** of the Visit. To improve the regression model, several regression runs were conducted.

The model with the highest r^2 was generated when average scores for Bothersome to Crowdedness and Average scores for **Negative Observations** (observing vandalism, walking off the trail, littering, etc.) were included. That is, an r^2 of 21% with a p-value of the F-test of .000. As expected, these additional predictors, being significant, have an inverse effect on Overall Experience.

Although the r^2 values in this study are relatively modest, this aligns with the nature of research that relies on ordinal-scale perception data, such as Likert-type responses. Note that in prior studies (e.g., Needham et al., 2011) have similarly emphasized that the aim is not strong predictive accuracy, but the establishment of experience-based thresholds to inform visitor management. It should be emphasized that, as Shelby and Heberlein (1986) explained, social carrying capacity studies – particularly in ecotourism – are intended to guide planning decisions through prescriptive insights, rather than forecast visitor behavior with statistical precision.

In a similar study conducted in European mountain national parks (Rogowski et al., 2025), visitor motivations, demographic profiles, and seasonal preferences were observed to strongly influence perceptions of crowding and satisfaction.

Specifically, in Tatra National Park, it was reported that visitor flow significantly increased from 2017 to 2022 (reaching 4.5 million annually and exceeding 47,000 visitors per day during peak periods). In another area (Pieniny National Park), visitation peaked at ~15,000, and summer visitor indices exceeded 300% of the average. This study highlights the importance of integrating socio-cultural and psychological dimensions of carrying capacity together with the ecological limits of the area, as well as accounting for reduced seasonality (Gini coefficient dropping to 0.43) and weekend concentration (seasonality index > 6.0 in autumn). These findings support the use of perceptual data to support visitor management strategies. These findings parallel the observed patterns among Mt. Pulag climbers and further highlight the importance of having a tailored, visitor-centered approach to ecotourism planning.

Moreover, as in Kim et al. (2019), social big data (such as geo-tagged photographs from social media) can be used effectively to identify visitation hotspots, spatial patterns of use, and visitor preferences in protected areas, even in data-scarce developing countries. Their study highlighted a strong correlation ($r = 0.90$) between Flickr-derived visitation proxies and observed tourism revenues, stressing the potential of such approaches to complement traditional surveys and support adaptive visitor management. Given the popularity of Mt. Pulag and the availability of online data, it suggests that Mt. Pulag's social carrying capacity assessment could also explore integrating big data analytics in the future to supplement perception-based methods and monitor crowding dynamics more efficiently.

6.5 Objective 3: Recommend Visitor Management Strategies Based on Social Carrying Capacity

The statistical findings reinforce the need to revisit existing crowd limits by incorporating visitor perception data. This can be done by:

- Using perception-based indicators (e.g., crowding and botheredness scores) in regular visitor experience monitoring.
- Enforcing group size limits per site based on established thresholds.
- Incorporating social carrying capacity thresholds into MPNP's Ecotourism Plan and Protected Area Management Plan (PAMP), as required under DENR AO 2013-19 and DENR MC 2021-02. Likewise, it should be integrated into the respective Comprehensive Land Use Plans (CLUPs) and Local Ecotourism Plans of the municipalities that have access trails to the park.

- Coordinating closely with local government units (LGUs) of all municipalities and provinces covered by Mt. Pulag (e.g., Benguet, Nueva Vizcaya, and Ifugao) to ensure that ecotourism plans, visitor regulations, and enforcement mechanisms are harmonized. As the park spans multiple jurisdictions and has numerous access points, effective management of visitor flows requires inter-LGU coordination.
- Consulting with Indigenous Peoples (IPs) and other community stakeholders to respect sacred grounds, gain support for visitor limits, and align tourism practices with ancestral domain rights. Their participation in zoning decisions and management should be institutionalized.
- Implementing spatial and temporal zoning strategies, such as:
 - Restricting summit access during weekends to pre-registered hikers;
 - Redistributing visitors to alternative peaks or trails (e.g., Akiki, Tawangan); and
 - Offering incentives for weekday visits.
- Investing in visitor educator campaigns about responsible recreation and Leave No Trace principles.

6.6 Additional Observations

Respondents also noted visual and environmental degradation in areas with foot traffic, such as widened trails, litter at campsites, and noise at the summit (see Figure 5). These qualitative findings reinforce the need for proactive management and support the call to implement multi-dimensional carrying capacity assessment – including biophysical, psychological, and managerial dimensions – to preserve Mt. Pulag's natural and experiential value.



Source: MPNP PAMO, 2020

Figure 5. Widened Trails

6. Conclusion and Recommendations

This study sought to determine the perceived social carrying capacity of Mount Pulag National Park, assess the relationships among visitor motivations, perceived crowding, and experience quality, and recommend ways in which social carrying capacity can support ecotourism planning. The findings affirm the value of a visitor-centered approach to managing ecotourism in protected areas.

First, the study identified visitor-specific thresholds for acceptable crowd levels at key recreation sites within MPNP. The summit and campsites were consistently reported as the most crowded, especially during weekends and peak season. A similar incident was reported by one of the respondents (see Figure 6) during the peak seasons in Mt. Pulag.

The identified visitor-specific thresholds, which define the park's social carrying capacity, offer a practical guide for limiting visitation and minimizing experiential degradation.



Source: Withheld at owner's request

Figure 6. "Sea of Crowds" at the summit of Mt. Pulag

Drawing on respondents' perceptions of crowding and overall satisfaction, the study proposes realistic visitor thresholds to inform site management. This approach reflects the prescriptive frameworks outlined by earlier scholars, including Heberlein and Vaske (1977) and Shelby and Heberlein (1986), who emphasized the value of perception-based models in determining social carrying capacity.

Second, the study confirmed that crowding negatively affects recreational experience, particularly for visitors motivated by solitude, personal reflection, or communion with nature. These findings demonstrate the need to align visitor use patterns with users' motivational and perceptual profiles to preserve the quality of ecotourism experiences.

Third, the results underscore the feasibility of using social carrying capacity indicators to guide decision-making and policy interventions. Respondents expressed strong agreement on the need to protect Mt. Pulag's unique environmental and cultural attributes – implying a public willingness to support visitation control measures, provided these are transparent, fair, and grounded in sound planning.

The following recommendations are made:

1. Institutionalize social carrying capacity as a regular input in the planning, monitoring, and evaluation of Mount Pulag's tourism activities. This is aligned with DENR AO 2013-19 and DENR MC 2021-02, as well as the provisions of the Expanded National Integrated Protected Areas System Act (RA 11038).
2. Integrate perceptual indicators (e.g., crowding tolerance, botheredness scores) into regular visitor surveys and use them in setting limits and adjusting management practices.
3. Establish site-specific visitor limits based on this study's crowding thresholds and enforce group size limits at entry points.
4. Distribute visitation more evenly by encouraging weekday visits, opening alternative trails or viewing sites, and adjusting park access fees based on time and volume.
5. Promote educational programs that highlight responsible recreation and environmental stewardship to improve visitor behavior and perception.
6. Engage with Indigenous Peoples (IPs) and local stakeholders to ensure cultural sites are respected, and management decisions are inclusive.

Social carrying capacity provides a viable and adaptive framework for sustainability, balancing tourism growth with conservation imperatives. If properly implemented, it can help ensure that Mount Pulag remains a treasured destination – valued not only for its scenic beauty, but also for the quality of experience it offers to present and future generations.

Acknowledgment

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Main Author's Declaration

This article, entitled “Using Social Carrying Capacity for Ecotourism Planning: A Case of Mt. Pulag National Park, Philippines,” is a condensed and peer-reviewed version derived from the author's graduate thesis submitted to the University of the Philippines – School of Urban and Regional Planning in partial fulfillment of the requirements for the degree of Master of Arts in Urban and Regional Planning. The article retains the core research questions, methodology, and findings of the thesis but has been reformatted and revised to meet journal standards. The listed co-authors provided academic guidance and technical support during thesis development and manuscript preparation. This work has not been published elsewhere and is not under consideration in any other journal.

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