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Sustainable Tourism Development Strategy for Cold Desert Landscape: Case of Mountainous Village, Nako

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ABSTRACT

Background: Carrying capacity assessment is an important component of maintaining sustainability in the tourism sector. All the concerns in tourism are linked to the number of tourists that visit a particular spot. The study area has beautiful landscapes in the cold desert ecosystem as well as Buddhist distinctiveness, which attracts mass tourism. Nowadays, tourism development has introduced concerns about sustainability and establishing standards for tourist destination capabilities.

Objectives: The present study aims to analyze the following objectives: 1) To assess the physical carrying capacity (PCC), real carrying capacity (RCC), and effective carrying capacity (ECC) of selected tourist spots in Nako village and 2) To calculate the parking capacity of the monastery.

Methodology: The methods specified in the International Union of Conservation of Nature and Natural Resources (IUCN) were used to measure the carrying capacities of particular tourist destinations in Nako. Three-level techniques were applied to assess the physical (28161 persons), real (4162 persons), and effective (2968 persons) carrying capacities.

Results: Results indicate that ECC is the most suitable for the estimation, and the current situation of tourism is underexploited in the study area.

Conclusion: There are very small to large types of systems found in Nako, and these systems also support different types of activities. Tourism is a highly practiced activity, and it has environmental, social, cultural, and economic impacts. They are dependent on different parameters and also vary with the changing nature of the interaction. It is found that the present status of tourism activity in the study area is highly underexploited vis-a-vis it carrying capacity.

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1. INTRODUCTION

The globalization of capitalism and advances in transportation and communications technology play a vital role in booming the flows of the tourism industry. International tourist arrivals were 25 million in 1950, and the number will be over 1.8 billion in 2030. In recent years, the carrying capacity and sustainability of destinations have been intensively discussed due to a persistent growth trend in the tourism industry, which was only provisionally paused by the COVID-19 pandemic (Zekan et al., 2022). Moreover, the number of international tourist arrivals reached 88 percent of pre-pandemic levels, with an estimated 1.3 billion international arrivals (UNWTO, 2023). The industry of tourism has become one of the world's highest-priority industries and employers, as well as leading job creators in world economies. Also, the tourism industry is a contributor to the country's foreign exchange (Nursyam et al., 2023) as well as a significant contribution to the economies of the destinations (Masteriarsa & Riyanto, 2023). It offers an excessive chance for change and is also a vehicle for added earning at any place (Kruk et al., 2007). The continuously unintended misuse of resources is abolishing the basic functionalities of the environment and creating a risk of reducing the recovery magnitudes of destinations (Hassan et al., 2014). These problems are linked to the 'magic number of tourists that visit certain destinations. The increasing interest in the sustainability of tourism development has initiated concerns about the capability of tourist destinations. Greater importance is also given to the concept of sustainable tourism development in decision-making strategies (Vandarakis et al., 2023). Furthermore, there is a necessity for the calculation of the carrying capacity of an area. Carrying capacity is the ability of an area to support human activities without any negative impact (Aryanto et al., 2016; Siahaan et al., 2023). The number of visitors and space availability are considered key factors or expandable by accommodating infrastructure or even land reclaiming in extreme cases (Tejada et al., 2009).

Carrying capacity is "the maximum number of people who can use a site without an unacceptable alteration in the physical environment and an unacceptable decline in the quality of experience gained by visitors" (Mathieson & Wall, 1982; Simon et al., 2004). The World Tourism Organization (WTO, 1993) defined carrying capacity as "the maximum number of people that may visit a tourist destination at the same time without destroying the physical, economic or socio-cultural environment and an unacceptable decrease in the quality of visitors' satisfaction" (PAC/RAC, 2003).

Recently, the world has faced several misfortunes at prominent destinations such as Nainadevi (2008), Kedarnath (2013), The Atal Tunnel on the Manali-Leh highway (2018), Sonamarg (2023) in India, and Mecca (2015) in Saudi Arabia; also defined as dark tourism. Moreover, a water crisis occurred in June 2018 at famous tourist destinations named Shimla and Manali in the Himalayas. Further in 2018, the Archaeological Survey of India decided to limit the number of tourists based on the final recommendation in the report submitted by the National Environmental Engineering and Research Institute (NEERI) at the Taj Mahal to 40,000 persons per day. In Himachal Pradesh, the government launched a new scheme in 2019 named "Nai Raahein Nai Manzilien" with a budget allocation of 50 crores to identify and develop unexplored/untapped tourist places. All the troubles are related to the number of tourists who visit a destination.

However, several destinations will develop without any planning of a tourist destination (Herlambang et al., 2016). Moreover, academics have been trying to develop, test, and implement tools for maintaining sustainability by measuring tourism carrying capacity (Panousi & Petrakos, 2021; Karagiannis & Thomakos, 2020). Besides, the World Tourism Organization issued a handbook with a large number of indicators of sustainable growth for tourism destinations. Similarly, UNEP-WTO (2005) recommended a guide with policies and indicator tools constructed on actual cases from all over the world. The European Commission (2006) also published a methodological manual for the assessment of the sustainable development of tourism (Vandarakis et al., 2019; Karagiannis & Thomakos, 2020).

Hence, in the context of the above discussion, basic planning for any tourist destination has been considered the benchmark for tourism regulation as well as management. The concept of carrying capacity expresses a threshold or several assumptions that are supported by particular tourist spots. It is linked to human activities impacting a region. (Zekan et al., 2022). The concept is most important for tourism planning (Nghi et al., 2007) as well as an important discipline for sustainable tourism development (Pasko, 2016). Because, it gives an idea of the threshold that can be accepted at a particular destination (Pazienza, 2004). Moreover, the Ministry of Tourism (2022) has focused on promoting environmental sustainability, protecting biodiversity, promoting economic sustainability, and promoting socio-cultural sustainability. The strategy aims to mainstream sustainability into the tourism sector. The estimation of TCC should help establish mechanisms leading to the participation of performers connected to the high altitude and thereby contribute to a pertinent eco-friendly tourism proposal that would be important for the welfare and sustainability of destinations.

The present study aims to analyze the following objectives:

- To assess the physical carrying capacity (PCC), real carrying capacity (RCC), and effective carrying capacity (ECC) of selected tourist spots in Nako village.
- To calculate the parking capacity of the monastery.

1.1. Background and theoretical foundations of research

In the planning of tourism sustainability, carrying capacity is considered a multidisciplinary approach. In 1936, the concept of carrying capacity was developed regarding the maximum load of a cargo ship (Stankey, 1981). After that, the concept was familiarized in the fields of ecology, biology, sociology, geography, recreation, and tourism. Dasmann used the concept in 1945 for the assessment of forest capacity in animal reproduction (Wall, 1983). Carrying capacity refers to the capacity of a destination or area of natural resources, ecological environment, infrastructure, and social facilities. Similarly, the physical carrying capacity is "the maximum number of people who can use a site without an unacceptable alteration in the physical environment and without an unacceptable decline in the quality of experience gained by visitors" (Mathieson & Wall, 1982; Simon et al., 2004). Physical capacity is concerned with the amount of space in areas (Shelby & Heberlein, 1984) or with the maximum number of 'use units' i.e., people, vehicles, and boats that can be physically accommodated in an area (Pigram, 1983). Sometimes, it can be considered a design concept, and impacts can be thought of as 'space parameters. The mathematical calculation continues to develop in the field of tourism for sustainable development. It is often used to specify limitations for tourist use and measure the impacts at each destination. Carrying capacity varies from one place to another according to local area characteristics and constraint factors. Several methods enable the evaluation of the number of visitors as tourism carrying capacity (TCC) (Cifuentes, 1992), which takes into account three levels of analysis: physical carrying capacity (PCC), real carrying capacity (RCC), and effective carrying capacity (ECC), where PCC>RCC>ECC (Queiroz et al., 2014). Several studies have been carried out concerning different aspects of the carrying capacity for national parks and protected areas (Cifuentes et al., 1990; Papageorgiou & Brotherton, 1999; Lawson et al., 2003; Nghi et al., 2007), marine national parks (Davis & Tisdell, 1995; Leujak & Ormond, 2007), tourist resorts and beaches (Sowman, 1987; Saveriades, 2000; Silva, 2002; Silva et al., 2007) and recreational activities such as mountain biking (Symmonds et al., 2000), boating (Tarrant & English, 1996; Diedrich et al., 2009) and canoeing (Sterl et al., 2004). Another study suggested that maintaining sustainability at tourist destinations; not only necessary for space assessment but also a pre-requisite to measuring the capacity of basic facilities like toilets, water, and parking that are provided by any destination (Jangra & Kaushik, 2017). At last, various international organizations such as the WTO, OECD, UN, and UNESCO EC have increased their awareness of the sustainability of the tourism sector.

2. METHODOLOGY

2.1. Methods

The formula developed by Cifuentes (1992) and proposed by the International Union of Conservation of Nature and Natural Resources (Ceballos-Lascurain, 1996) has been adopted to assess the carrying capacity. It is based on the area's particularities and characteristics that efforts to establish the extreme quantity of visits can be tolerated. The carrying capacity is allocated to different heads:

2.2. Physical Carrying Capacity (PCC)

It is defined as the maximum number of tourists who can physically fit into a specific area over a given time (Rukmana & Hadiwati, 2020; Sumaraw et al., 2019). The general equation used to calculate PCC is:

$PCC = A \times V/a \times Rf$

Where;

PCC= Physical carrying capacity

A= Area available for tourism (m^2)

V/a= Appropriate space for a displacement of tourists/tourist density (tourists/ m2)

Rf= Rotation factor (number of visits per day)

2.3. Real Carrying Capacity (RCC)

RCC is defined as 'the maximum allowable number of tourists to the specific site within a given area, once the reductive/corrective factors (**Cf**) derived from the particular characteristics of the site have been applied to the PCC'. The following formula better explains the RCC with corrective factors in percentages that are used in the study:

$RCC = PCC \times (100- Cf_1)/100 \times (100- Cf_2)/100 \ldots\ldots (100- Cf_n)/100$

The Cf is based on the observation that certain factors, such as environmental, ecological, social, and management characteristics are closely linked to the specific conditions and characteristics of each site. They are expressed as follows:

$Cf = M_1 / M_t \times 100$

Where;

Cf = Corrective factors

M_1 = Limiting magnitude of the variable

M_t = Total magnitude of the variable

Correction Factor (Cf): In any natural area, the tourism industry is highly dependent on climatic variables that affect a particular destination. The climatic factor works in two ways; first, it attracts tourists, and second, it limits tourist activities. Moreover, many times the local condition, i.e., social attitude, crime rates, crowding, etc., of the destination is also considered a correction factor. Therefore, in the

context of sustainability, evaluation of the potential factors that affect tourism numbers or limit touristic activities is essential. In this study, a total of 5 natural factors (rainfall, snowfall, frost, landslides, and temperature) and 2 man-made factors (accommodation and transportation) have been selected which limit the tourist development in Nako (table 1).

Table 1. Correction Factor Applied on Nako

Corrective factor (Cf)	Alias	Cf	Cf (100-Cf_1)/100)
Rainfall correction factor	Cf_1	16.98	0.83
Snowfall correction factor	Cf_2	36.98	0.63
Frost correction factor	Cf_3	24.65	0.75
Temperature correction factor	Cf_4	24.65	0.75
Landslide's correction factor	Cf_5	25.20	0.75
Accommodation correction factor	Cf_6	22.50	0.77
Transportation correction factor	Cf_7	13.34	0.87

2.4. Effective Carrying Capacity (ECC)

It is the maximum number of tourists that a spot can sustain, given the management capacity (Mc) that is available at a particular place. It is the result of the combination of RCC and the available management capacities of the area. In reality, it is the sum of the conditions that the tourism management of any destination requires if it is to carry out its objectives and functions. Management capacities (Mc) were based on the available infrastructure, facilities, parking, amenities, equipment, staff, etc. (table 2). The equation is:

$ECC = RCC \times Mc_1 \times Mc_2 \ldots\ldots\ldots\ldots \times Mc_n$

Where;

ECC = Effective carrying capacity

RCC = Real carrying capacity

Mc = Management capacities

Table 2. Indicators of Management Capacity Applied to Assess ECC at Tourist Spots, Nako

Indicators		Classification		
		Low (1)	Medium (2)	High (3)
Accessibility	Mc_1	Absent	Little	Adequate
Parking	Mc_2	Absent	Little	Adequate
Lighting	Mc_3	Absent	Little	Adequate
Public bathrooms	Mc_4	Absent	Little	Adequate
Drinking Water	Mc_5	Absent	Little	Adequate
Waste bins	Mc_6	Absent	Little	Adequate
Safety	Mc_7	Absent	Little	Adequate
Personnel	Mc_8	Absent	Little	Adequate
Food-joints	Mc_9	Absent	Little	Adequate
Presence of animals	Mc_{10}	Frequent	Moderate	Absent

2.5. Parking Capacity

Parking space is one of the major problems at tourist spots. Large gatherings of tourists during the peak season create traffic chaos at the destination. The most frequent mode of transport used by tourists in the study area is a car or taxi. The standard size of a car parking according to IRC norms is approximately 5 meters by 2.5 meters with suitable clearances all around (Fig. 1). Standards given by the Indian Road Congress (IRC) were used to calculate the parking capacity at tourist spots.

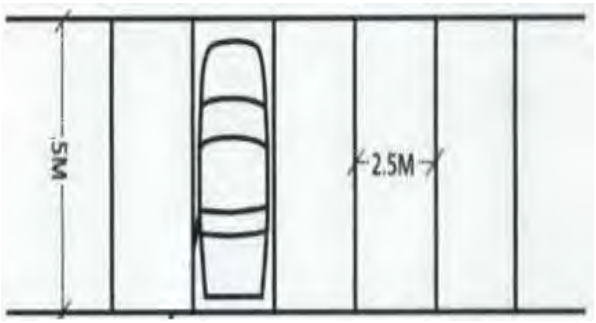

Fig 1. Sketch of standard space for each car

2.6. Field Visits

A survey based on evaluation usually involves acquiring a desired or undesired result (Best & Kahn, 1998). A simple random sampling method was applied to collect the required data, such as comfortable space and time to visit any tourist spots. The last section of the questionnaire covered the questions concerned with the physical carrying capacity of the destination. A total of 80 questionnaires were collected in June 2016 due to the location of the study area.

To fulfill the requirements of the formula given by IUCN, there is a need to know the comfort level of tourists at any destination in terms of space and time. The available area for tourism at 2 tourist spots was calculated through a land use/land cover map, which is based on the latest available imagery downloaded from open-source Google Earth Pro for the year 2021. In the context of the area required per tourist, the average standard of individual comfort depends on the decisions of management and planners, which may vary from 2 to 10 sq. metres depending on the particulars of the visited spot (Masum et al., 2013). Different studies have adopted different criteria for the space requirement of a visitor, i.e., 1 m2 per visitor (Sayan & Atik, 2011; Queiroz et al., 2014), 2 m2 per visitor (Masum et al., 2013), 2.5 m2 per visitor (Daneshvar et al., 2017), 5 m2 per visitor (Bera et al., 2015), and 5 to 10 m2 for tourists on beaches or riverside (Zacarias et al., 2011). It may differ from person to person as well as from destination to destination. Table 3 shows the observation of the average time and area required by a tourist collected through a field survey.

Table 3. Space and Time for Different Zones Assigned by Tourists

Tourist spots	Activities/usage	Area required (m^2)	Average time
Monastery	Movement	2	2 hours
	Seating		15 minutes
Lake	Walking	5	30 minutes

Source: Field survey, 2016

2.7. Study Area

In the Trans Himalayan culture, Nako village (Kinnaur) is a picturesque landscape and unspoiled ecosystem village at a height of 12,000 feet. It is situated between 31˚52'53″ North latitude and 78˚37'38″ East longitudes near the Indo-China border (Fig. 2).

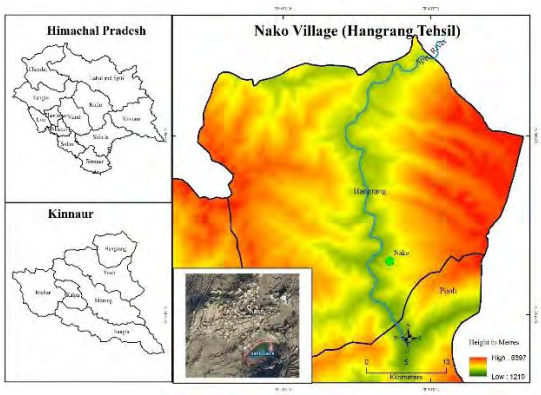

Fig 2. Location map of the study area

With an average of 1,11,393 tourist arrivals per year from 1990 to 2020, Kinnaur gives huge exposure to tourism worldwide. In the world, there are several cold deserts, like Antarctica, the Arctic region, parts of Central Asia (such as the Gobi Desert), and parts of North America (such as the Great Basin Desert). These deserts experience extremely low temperatures, with freezing winters and short, cool summers. Furthermore, the study area also lies in the cold desert of India, known as the "Land of the Fairytales," due to the blessing of greenery and the home of many rare species. Moreover, masses of snow add beauty to the highest village in the valley. Tourism has emerged as the main source of livelihood and employment generation in the study area, and it offers a wide range of possibilities such as unique natural attractions, cultural richness, hiking, skiing, rock climbing, mountain biking, etc. There are two major landmarks; Nako Monastery and Nako Lake. The monastery was established in 1025 AD and consists of the four oldest halls known as 'Dukhong'. The building was affected by the earthquake of 1975, and it was nearing collapse in 1998. In this view, in May 1998, the University of Vienna, in association with the Indian National Trust for Art and Cultural Heritage (INTACH), launched a research project focusing on preserving art & culture. Similarly, in July 2002, the Nako Preservation Project (NPP) was established for the conservation of monasteries and other cultural heritage buildings in Nako (District Census Handbook, 2011).

3. RESULTS AND DISCUSSION

3.1. Assessment of carrying capacities at selected destinations, Nako

Different types of carrying capacities have been assessed for two destinations of Nako village in Kinnaur district. To fulfill the requirement of IUCN guidelines recommended for calculating carrying capacities, land use/land cover have been calculated using Google Earth Pro images.

3.2. Land use/land cover of selected tourist spots in Nako

3.2.1. Religious Spots

Pilgrimage tourism is one of the major sectors contributing to the growth of the Indian economy. The dominant religion is Hinduism in lower Kinnaur and Buddhism in the upper areas. Therefore, the study area has a rich cultural and religious identity, with several Hindu temples and Buddhist monasteries. The selected religious spot is:

- **Nako monastery**

For the estimation of physical carrying capacity, different categories were identified through land use and land cover maps, which were made of selected tourist spots. Only those zones that can be used by visitors have been considered for PCC analysis. Broadly, two major zones movement zones and seating stairs have been used by tourists at religious spots in Nako village of Kinnaur.

3.2.2. Natural Spots

Nako village has emerged as a desirable tourist destination in Himachal Pradesh with its physiographic peculiarities and ensuing climatic conditions. The ecosystem of the cold desert as well as the cultural uniqueness of the tribal community make it unlike any other in the world. Moreover, there are a lot of opportunities in the sector of adventure tourism. The destination also offers a wide range of possibilities, such as unique natural attractions, hiking, skiing, rafting, kayaking, rock climbing, mountain biking, bungee jumping, paragliding, etc., that attract mass tourism. The natural tourist spots that have been selected for assessing PCC are:

- **Nako lake**

At a height of 11,000 feet, 'Nako Lake' offers a stunning Himalayan panorama. It is a quaint lakefront in the middle of the remotest villages in Kinnaur. A foot like 'Saint Padmasambhava' has been built on the nearby lake. The periphery of the lake has plantations of 'willow' and 'poplar' trees. The lake has facilities for ice skating practiced on the lake's surface during the winter season when it gets frozen. Figures (3 and 4) and Tables (4 and 5) show the land use/ land cover maps with the area of identified categories of tourist spots in Nako.

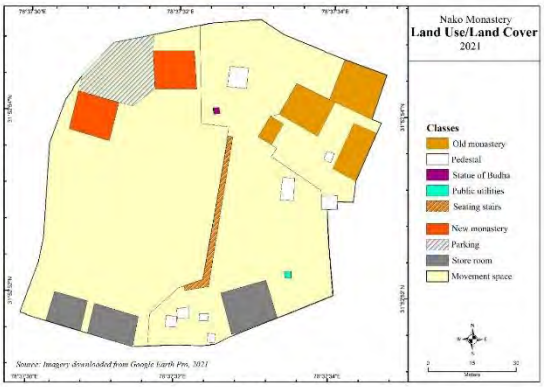

Fig 3. Land Use of Nako Monastery, Nako

Table 4. Area of Land Use of Nako Monastery, Nako

Classes	Area (sq. metres)
Old monastery	
Monastery	612.74
Interior open space	577.85
Storeroom	224.52
Pedestal	153.18
Statue of Buddha	4.53
Public Utilities	5.04
Seating stairs	112.54
Movement space	3366.32
Total area	5056.72
New monastery	
Monastery	372.35
Storeroom	286.62
Parking	428.45
Movement space	4054.01
Total area	5141.43
Total Area (old + new monastery**)**	**10198.16**

Source: Area calculated through imagery downloaded from Google Earth Pro, 2021

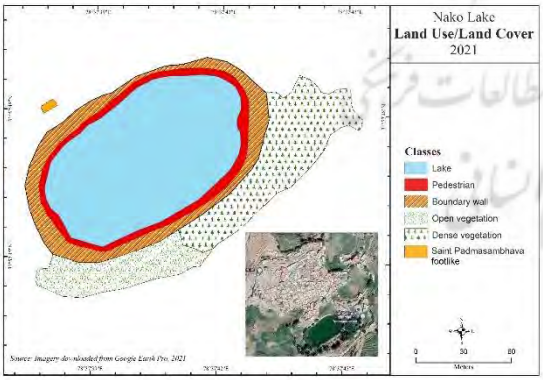

Fig 4. Land Use/ Land Cover of Nako Lake, Nako

Table 5. Area of Land Use/ Land Cover of Nako Lake, Nako

Classes	Area (sq. metres)
Lake	8826.67
Pedestrian	1565.28
Boundary wall	2908.01
Saint Padmasambhava foot-like	46.71
Dense vegetation	3970.39
Open vegetation	2121.55
Total	**19438.61**

Source: Area calculated through imagery downloaded from Google Earth Pro, 2021

3.3. Estimation of Physical Carrying Capacity (PCC)

In this context, to investigate the PCC, there is a need to calculate and assess the required data, i.e., suitable area for tourism, area available per user, visit duration, etc. Additionally, the rotation factor is considered an important indicator at any visiting place for inferences about the tourism capacity. In the context of the present study, there has been a dearth of official data on the number of tourists that visit particular tourist spots and other essential parameters. The areas of destinations where tourists go camping have been considered to calculate the PCC. The daily open hours have been taken based on their timing limitations, such as 13 hours (sunrise to sunset timing) for natural protected areas (lake) and worship timing hours (total of 9 hours) for religious spots, to evaluate PCC for tourist spots in Nako. Furthermore, the formula given by IUCN was applied to calculate the final PCC for each selected tourist spot (Table 6).

The maximum PCC has been observed at Nako monastery, with 20022 visitors per day. As discussed in the methodology, PCC depends on available land for tourism and the duration (opening time) of the visit. PCC includes the maximum number of tourists that can physically fit at a certain time and place. Nako has a famous and beautiful lake and an old monastery. In May 1998, the University of Vienna, in association with the Indian National Trust for Art and Cultural Heritage (INTACH), launched a research project focusing on preserving art & culture. Similarly, in July 2002, the Nako Preservation Project (NPP) was launched for the conservation of monasteries and other cultural heritage buildings in Nako (District Census Handbook, 2011). A new structure has been built near the heritage old monastery building with the facility of parking. Therefore, maximum capacity has been noticed in the Nako monastery. Besides, the lake has a very congested pedestrian network, and the construction within a buffer zone of the lake affects the destination attraction adversely. The lower side is surrounded by village settlements, and recently even the upper catchment area, which is the source of water replenishment for the lake, is experiencing the appearance of hotels, campsites, and guest house buildings.

Table 6. Physical Carrying Capacity Estimation of Selected Tourist Spots, Nako

Destinations	Zones	Derived PCC (A × V/a × Rf)		PCC (Diurnal)
Nako monastery				20022
Movement space		$7998.18 \times \frac{1}{2} \times \frac{9}{2}$	17996	
Seating stairs		$112.54 \times \frac{1}{2} \times \frac{9}{15 \div 60}$	2026	
Nako lake				8139
Pedestrian		$1565.28 \times \frac{1}{5} \times \frac{13}{30 \div 60}$	8139	
Total				**28161**

Source: Calculated by the author as per IUCN guidelines

3.4. Parking Capacity

Nako Monastery is one of the old monasteries established in the 11th century. In 1975, the building of the monastery was affected, and artworks in the monastery were damaged. Recently, a new building was constructed within the premises of the old monastery. During the peak season, several tourists visited the monastery, which created traffic parking problems. Similarly, on an auspicious occasion in Buddhism, traffic chaos is also created within the premises of the monastery. Therefore, parking space is also one of the major problems in such religious spots.

Table 7. Estimation of Parking Capacity of Nako Monastery, Nako

Types of parking space	Parking standards/norms in metres				Parking space of monastery (m^2)	Carrying capacity
	Length	Width	Minimum headroom	Total (L × W × headroom)		
Private cars and taxis (ECS)	5	2.5	2.4	30	428.45	14

Source*:* Calculated by the author as per IRC norms.

The standard size of a car parking according to IRC norms is approximately 5 metres by 2.5 metres with suitable clearances all around. In the context of the Nako monastery, the destination has sufficient space for tourists' daily parking. However, an increase in the number of vehicles at important events creates additional demand for parking. Table 7 gives an estimation of the space required for a specific vehicle type to calculate the carrying capacity of the destination. Parking space for one type of vehicle (equivalent car space (ECS)) at the destination, i.e., a car or taxi which is the chief mode of transportation in Nako, is 14 per day at a time.

3.5. Estimation of Real Carrying Capacity (RCC)

To estimate the RCC, different natural and man-made correction factors were used, which are specific to each tourist site. PCC is only theoretical, and further considering some specific correction factors, the RCC was calculated to check the extreme value of PCC. A total of seven correction factors - rainfall, snowfall, frost, landslides, temperature, accommodation, and transportation have been considered for this study.

In the present research, the total limiting values of the correction factor were about 0.157. The snowfall correction factor (Cf2) had the greatest influence on the limiting factor (0.63) on the overall RCC. The study area is situated in the cold desert area of the Himalayas; hence, in this context, it led to a considerable reduction in the number of tourists. The values of around 1 for the correction factor 'transportation' indicate that it did not affect RCC. Instead, visitors enjoy the high-terrain driving and biking that offer adventure during tourist visits. After applying the correction factors to PCC, the real carrying capacities were calculated for selected tourist spots in Nako village (Table 8). The RCC was estimated as follows:

$$RCC = PCC \times Cf_1 \times Cf_2 \times Cf_3 \times Cf_4 \times Cf_5 \times Cf_6 \times Cf_7$$

As for the results of the correction factors, the total RCC of Nako village (for selected destinations) is 4162 visitors per day, which is the frequency of the maximum permissible number of people that should be allowed or supported by particular tourist spots.

Table 8. Correction Factor Applied to Assess RCC at Tourist Spots, Nako

Destinations	PCC (Diurnal)	Indicators							RCC (Diurnal)
		Cf_1	Cf_2	Cf_3	Cf_4	Cf_5	Cf_6	Cf_7	
Nako monastery	20022	0.83	0.63	0.75	0.75	0.75	0.77	0.87	2959
Nako lake	8139	0.83	0.63	0.75	0.75	0.75	0.77	0.87	1203
Total	**28161**								**4162**

Source: Calculated by the author as per IUCN guidelines

3.6. Estimation of Effective Carrying Capacity (ECC)

Generally, ECC is the sum of the conditions that the tourism management of any destination requires if it is to carry out its objectives and functions. Therefore, in this context, optimal management capacity (Mc) is defined as the best state of conditions that a tourist destination has to develop its activities and reach its objectives under the administration of a tourist destination (Cifuentes et al., 1992). Correspondingly, ten management capacities were considered to calculate ECC according to the methodology of Cifuentes (1992). These variables are:

- Accessibility
- Parking
- Lighting
- Public bathrooms
- Drinking Water

- Waste bins
- Safety
- Personnel
- Food-joints and
- Presence of animals

In addition, these selected components were evaluated based on quantity and location criteria. Quantity just estimates the relationship between an existing or optimal quantity, which is based on the judgment of the author. Alternatively, location accounts for the appropriate spatial distribution of managing capacities in particular areas. Moreover, it was important to convert qualitative criteria into quantitative ones to undertake a more objective estimation of the Mc. Subsequently, all selected managing factors were evaluated at three levels, i.e., 1 (absent), 2 (little), and 3 (adequate). The Mc of each tourist spot was estimated by calculating the value of all selected variables. Further, according to RCC values and the mentioned managing factors, daily ECC values were estimated as per the following formula:

$$ECC = RCC \times Mc$$

Table 9 expresses the number of visitors per day, which ranged from 601 to 2367 per day at any tourist spot. These differences mainly depend on the facilities developed by the local administration as well as the correction factors included in the RCC. Additionally, the results indicate that each level constitutes a corrected capacity level of the preceding level. It is clear to us from this assessment that PCC is always greater than the RCC, and the RCC is greater than the ECC. Comprehensively, ECC is the more acceptable type of carrying capacity than the other two. Moreover, it is most useful for tourism management to develop policies.

Table 9. Indicators of Management Capacity Applied to Assess ECC at Tourist Spots,Nako

Destinations	RCC (Diurnal)	Indicators										Mc	ECC (Diurnal)
		Mc_1	Mc_2	Mc_3	Mc_4	Mc_5	Mc_6	Mc_7	Mc_8	Mc_9	Mc_{10}		
Nako monastery	2959	3	3	3	2	2	2	3	2	1	3	0.80	2367
Nako lake	1203	1	1	1	1	1	3	3	1	1	2	0.50	601
Total	**4162**												**2968**

Note: *Absent (1), Medium (2), and Adequate (3)*

Source: Calculated by the author as per IUCN guidelines

As Table 9 indicates the optimum number of tourists that would be allowed on the tourist spots with existing conditions and management capacity, the total ECC for selected tourist spots in Nako is 2968 visitors per day. Considering the total ECC as well as the yearly tourist flow in the selected tourist spots of Nako, there is a risk of saturation or carrying capacity overload, particularly in the peak seasons. However, it can be concluded that the carrying capacity of Nako is preserved to accommodate a basic level of yearly tourist infiltration, but it can accommodate a higher level of tourist inflow if it provides better services and management facilities in the future. Further technological interventions can reduce the impact of constraints such as rainfall, landslides, poor roads, etc. to achieve the full potential of the selected destinations. Rather, some of the constraints, such as snowfall, can be converted into an additional attraction for tourists in places like Rohtang (Himachal Pradesh) or Pahalgam (Jammu and Kashmir). The cost of developing infrastructure can be recovered in a very short period if world-class road infrastructure is created and landslides are controlled using the best of technical know-how at the global level. It will be a boon to the area if exploited systematically.

4. CONCLUSION

The concept of threshold, or carrying capacity, can be a powerful basis for tourism management and sustainability. It is particularly important for cold desert destinations that are undergoing rapid change as a result of increased pressure in certain natural environments. Tourism could be considered a common ground for a new approach to sustainable tourism. Broadly, carrying capacity refers to the ability of a system to support an activity or feature at a given level. There are very small to large types of systems found in Nako, and these systems also support different types of activities. Tourism is a highly practiced activity, and it has environmental, social, cultural, and economic impacts. They are dependent on different parameters and also vary with the changing nature of the interaction. It is found that the present status of tourism activity in the study area is highly underexploited vis-a-vis it carrying capacity. Tourism carrying capacity can be an input for policies for sustainable tourism development. It can create balanced regional development, not only from tourism benefits but also from environmental outcomes. The stakeholders also must consider tourism's carrying capacity to create and realize sustainable tourism in Nako. Implementation of good infrastructure that can address the constraint factors and management practices and facilities will help to increase the capacity of the destinations. To maintain the carrying capacity of the destination, several recommendations include not cutting down trees, capping the number of visitors with parking

management strategies, and increasing the number of tourist officers for sustainable development.

4.1. Practical Relevance of the Research

This research may be relevant practically in sustainable tourism development to gain long-term benefits. The study will help to identify the most exploited as well as categorize the causes of destinations due to tourism activities. Research gives us a clear picture of tourism development based on the carrying capacity estimation of each selected destination. Moreover, the methodology can be used as a planning tool to determine a tourism limit that can be accepted at a destination. Also, research recommendations will be useful for controlling negative impacts and, in turn, improving the capacity of sites.

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