

## FROM LIFE CYCLES TO PATH DEPENDENCE: ECOTOURISM PATH FORMATION IN SIKKIM (INDIA)

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**Abstract:** The development of tourism destinations is traditionally interpreted using linear and cyclical models, such as the Tourism Area Life Cycle (TALC). However, growing uncertainty, environmental constraints and crisis events highlight the limitations of these deterministic approaches. This study addresses the growing need for alternative conceptual frameworks by applying evolutionary and path dependence perspectives to examine ecotourism development in Sikkim (India). This Himalayan state's tourism trajectory has been significantly influenced by geopolitical, institutional and environmental factors. The study's primary objective is to compare the TALC model's explanatory power with that of a path dependence approach in interpreting Sikkim's long-term tourism development trajectory, and to identify the pivotal historical decisions and institutional mechanisms that have shaped its current ecotourism-oriented pathway. The research also assesses future challenges related to sustainability and resilience in the context of continued growth and external shocks. The study is based on a mixed-methods approach, combining a quantitative analysis of tourist arrivals (1993–2024) - including compound annual growth rates and trend projections - with a qualitative analysis of policy documents, regulatory frameworks and key political and institutional turning points in tourism development. Sikkim's tourism development is interpreted through two analytical frameworks: the linear-cyclical Tourism Area Life Cycle (TALC) model, and a nonlinear evolutionary path dependence perspective. The results show that, although Sikkim currently corresponds to the 'development' stage of the TALC model, its tourism trajectory cannot be adequately explained as a universal life cycle. Rather, it represents a historically conditioned, path-dependent process, shaped by early access restrictions, environmental policies and the institutionalisation of ecotourism as a dominant development strategy. Key critical junctures, such as the transition to organic farming, the 2011 Ecotourism Policy, and the declaration of Sikkim as India's first fully eco-friendly state in 2016, created a stable but increasingly rigid development path based on regulated, low-impact tourism. However, rapid post-pandemic growth reveals emerging risks of environmental pressure, infrastructure overload and potential path lock-in. This study shows that evolutionary and path-dependent approaches offer a more reliable framework for understanding the non-linear development of tourism than classical life-cycle models do.

**Keywords:** Tourism Area Life Cycle, Evolutionary Economic Geography, Path dependence, sustainable tourism, ecotourism, Himalayas

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### INTRODUCTION

The evolution of tourism in a destination is a complex, historically conditioned process. It is shaped by the long-term interaction of natural and socio-cultural resources, social structures and the numerous economic activities of the various stakeholders involved in its development. Together, these factors create a highly heterogeneous system. There is a long tradition in interdisciplinary tourism research of attempting to conceptualise this process through theoretical models. Studying empirical cases to identify regularities or patterns in processes taking place in tourist destinations, and to predict future development trajectories, is an important part of planning and managing their development (Hall, 2008).

These efforts can historically be placed in the broader context of the development of regional science, economic geography and planning in the second half of the twentieth century, when tourism began to be understood as both a service sector and a specific form of regional development with social, environmental and political implications (Butler, 1980; Boschma, 2015). The first models of destination development were primarily based on linear and stage-based

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ideas about development and growth. These models were a natural reflection of the dominant theories of economic development and planning at the time, which were based on the assumption of gradual and relatively predictable development (Butler, 1980; Pearce, 1989). However, it gradually became apparent that destination development trajectories are significantly less linear, and more dependent on historical coincidences, political decisions, regulatory interventions and unexpected external shocks, than the classical models of the time had assumed.

Experiences of environmental crises, economic recessions and global pandemics have also highlighted the limitations of universal and deterministic interpretations of tourism development (Matlovič & Matlovičová, 2024; 2025).

These experiences have deepened doubts about the ability of classical models to capture nonlinearities, discontinuities, and the plurality of possible development paths (Russell & Faulkner, 2004; Hall, 2011; Brouder, 2020).

In this context, it is important to conceptualise destination development through theoretical models, not only as an analytical tool for scientific knowledge, but also in terms of its practical relevance for policy-making and strategic planning. These models enable empirical complexity to be reduced into analytically comprehensible structures, key processes of change to be identified, and comparable interpretative schemes to be created between different types of destinations (Hall, 2008; Bramwell & Lane, 2011). At the same time, they provide an epistemological basis for discussions on sustainability, management and the long-term consequences of tourism development. Current research therefore ranges across several paradigmatic approaches, from classical stage and system models to evolutionary and path-dependent frameworks, reflecting theoretical advances in the social sciences and the growing complexity of tourism as a global socio-economic phenomenon (Boschma & Frenken, 2006; Ma & Hassink, 2013; 2014).

Efforts to systematise the development trajectories of tourist destinations are therefore essential for understanding their development dynamics (Lochman & Vágner, 2022). Conceptual frameworks that capture the current complexity and uncertainty of the global tourism system also represent a means of understanding how destinations are changing in the context of globalisation, climate change and growing uncertainty (Matlovič & Matlovičová, 2024; 2025).

### **Theoretical models of tourism destination development**

The development of tourism in destinations can be interpreted using a variety of theoretical and conceptual models, which differ in terms of their level of abstraction, the discipline to which they belong, and their analytical focus. In general, these models can be divided into four basic groups: stage-based and cyclical models; systemic models; economic-development models; and evolutionary and path-dependent approaches models.

#### **a) Stage-based and cyclical models of tourism development (life-cycle models)**

One of the best-known and most widely used linear stage models is Butler's Tourism Area Life Cycle (TALC) concept (Butler, 1980). The TALC model assumes that destinations gradually progress through phases of discovery, engagement, development and consolidation before reaching a period of stagnation, decline or rejuvenation (Matlovičová & Matlovič, 2017). This model's popularity can be attributed mainly to its straightforward application in empirical studies, which allows it to be used to describe long-term trends in visitor numbers. However, despite its undoubted heuristic value and wide application in empirical studies, the current literature considers it to be a rather simplified and analytically insufficient framework. The main limitation of life-cycle models is their linear, deterministic understanding of destination development, which assumes the existence of a single, dominant developmental trajectory. However, this approach fails to adequately capture the nonlinearities, discontinuities, regressions or jumps between phases that commonly occur in tourism systems (Russell & Faulkner, 2004; Lew, 2011; Brouder, 2020).

Another issue with TALC is that it does not adequately consider the historical context of development (Martin & Sunley, 2006) or the impact of institutional structures, such as formal and informal rules, policies, regulatory frameworks and organisational arrangements that influence the behaviour of various stakeholders in tourist destinations (Boschma, 2005; Hall, 2011). Finally, TALC does not consider the potential interventions of a broad and highly heterogeneous network of actors with diverse and frequently conflicting interests. These actors' power positions and strategic decisions can alter the development trajectories of destinations (Hall & Page, 2014; Hall, 2011; Russell & Faulkner, 2004; Brouder, 2020). This means that, while the TALC concept implicitly assumes historical conditioning and institutional contexts, it does not conceptualise them as active mechanisms of development. Consequently, it only reflects the nonlinear nature of possible destination development trajectories resulting from interventions by actors and unexpected exogenous shocks to a limited extent (Hall, 2008; Russell & Faulkner, 2004). More precisely, the TALC model takes historical, institutional and actor factors into account in an undifferentiated and analytically weak manner, particularly in the form of implicit assumptions about a smooth transition between phases. Consequently, the TALC model is based on the assumption of a relatively stable external environment. However, in practice, tourism development trajectories are shaped by permanent uncertainty and repeated crisis shocks, as well as their cumulative and synergistic effects. These are referred to in the current literature as manifestations of polycrisis (see Matlovič & Matlovičová, 2024).

#### **b) System models**

System models are based on the assumption that tourism can be understood as a complex system comprising interconnected subsystems through which people, capital, information and services constantly flow (Leiper, 1979; Mill & Morrison, 1985). Within this framework, a destination is not interpreted as an isolated location, but as part of a broader structure involving demand, supply, infrastructure, the institutional environment and stakeholders. Leiper's model of tourism is considered the reference model for the systemic approach. It distinguishes three basic spatial components: the region of tourist

origin, the transit route region, and the destination region. These components interconnect tourist and service flows, ensuring the creation of a functional whole where a change in one part affects the others (Leiper, 1979). The key elements of Leiper's tourism system are spatial links and mobility, on which many later systemic interpretations are based.

Other systemic models include the Mill & Morrison (1985) model, which conceptualises tourism as a system consisting of four interconnected subsystems: the market (tourist demand, i.e. tourists and their needs, motivations, decision-making processes, and behaviour); the destination (the location's offerings, such as attractions, services, accommodation, infrastructure, and local resources); travel (transport systems, including transport infrastructure and distribution channels, as well as intermediary activities in the field of transport and travel services provided by tour operators); and marketing and management (the coordinating and regulatory elements of the tourism system responsible for planning, policy-making, promotion, and development management, as well as the coordination of actors and regulation). The focus here is on coordination mechanisms between actors, destination development planning, and optimising relationships between the market and service providers (Mill & Morrison, 1985).

The significance of system models lies in their ability to identify the links and flows between the various components of the tourism system. This provides a basic analytical framework for understanding how destinations function as a whole. Such models have proven particularly useful for tourism planning, management and impact assessment, as they facilitate the examination of interactions between demand, supply, infrastructure and the institutional environment (Leiper, 1979; Mill & Morrison, 1985). However, system models also have certain limitations, particularly when it comes to interpreting the long-term development of destinations. They focus more on structural relationships at a given point in time than on processes of long-term historical change. Their focus is on the simultaneous examination of the relationships between system components, with the diachronic processes of historical transformation and the developmental trajectories of destinations remaining in the background. Consequently, these models are static rather than dynamic and only capture the nonlinearities, discontinuities and historical conditionality of tourism development trajectories to a limited extent (Hall, 2008; Brouder, 2020). From a methodological point of view, these models primarily fulfil a descriptive and normative-managerial function, offering only limited causal explanations for the nonlinear development trajectories that frequently occur in tourist destinations and are historically conditioned.

#### **c) Economic-development and modernization models of tourism development**

Economic development and modernisation models are based on theories of regional development and development planning which dominated mainly during the second half of the 20th century. Here, tourism is interpreted as a tool for the economic growth and structural transformation of regions, particularly peripheral and less developed areas (e.g. Pearce, 1989; Telfer & Sharpley, 2008). These models are theoretically based on the *growth pole theory*, which assumes that development is concentrated in certain spatial nodes and then spreads to the wider region through multiplier effects (Myrdal, 1957; Brouder, 2020). Economic multiplier models follow this approach, examining how tourist spending stimulates local employment, income and secondary economic activities (Archer, 1977; Telfer & Sharpley, 2008). Export-based models also form part of the modernisation discourse, in which tourism is viewed as an export activity that generates income for the regional economy and promotes growth (Pearce, 1989). Within these approaches, tourism is conceptualised as an engine of economic development that can contribute to the diversification of the regional economy, job creation and the integration of peripheral areas into broader national and global economic structures (Sharpley, 2002; Telfer & Sharpley, 2008). In developing and post-socialist countries in particular, tourism is often seen as a means of modernisation, providing an alternative to the decline of traditional industrial or agricultural sectors (Pearce, 1989; Hall, 2008; Brouder, 2020).

Despite their importance for understanding the economic impact of tourism on regional development, economic development models are also the subject of widespread criticism. They often reduce tourism development to quantifiable economic indicators such as income, employment or investment, while only marginally reflecting the social, cultural and environmental consequences of destination development (Hall, 2008). This simplification can lead to conflicts of interest being underestimated, with power asymmetries between the public sector, investors, and local communities being ignored, as well as environmental limits to development. These factors can have a fundamental effect on the long-term sustainability of tourism systems (Boschma & Frenken, 2006; Brouder, 2020). In terms of conceptualising destination development, economic, development, and modernisation models are normative rather than explanatory in nature as they implicitly assume a linear transition from backwardness to growth through tourism. These models are only able to capture to a limited extent the historical conditionality, non-linearities and plurality of possible development trajectories emphasised in evolutionary and path-dependent approaches, which are currently receiving a great deal of attention (Boschma & Frenken, 2006; Brouder, 2020).

#### **d) Evolutionary and path-dependent approaches**

In response to these limitations, an *evolutionary approach* to destination development inspired by *Evolutionary Economic Geography* (EEG) has been favoured over the last two decades. EEG is based on an analogy with biological evolution; however, this is not intended to be taken in a deterministic or biologising sense, but rather as a heuristic framework for explaining the dynamics of socio-economic systems (Boschma & Frenken, 2006; Boschma, 2015; Brouder, 2020; Abe et al., 2024). According to this approach, destinations are open, complex and adaptive systems whose development results from processes of interconnection between variation, selection and retention (Boschma & Frenken, 2006; Ma & Hassink, 2013; 2014). Within the evolutionary approach, *variation* mainly arises through entrepreneurial initiatives, responses to external shocks or local experiments; that is to say, small-scale and often temporary attempts by tourism destination stakeholders to introduce new products, practices or organisational structures in specific spatial and

institutional contexts (Boschma & Frenken, 2006; Martin & Sunley, 2006; Ma & Hassink, 2013; 2014; Abe et al., 2024). The outcome of these initiatives is subject to a considerable degree of uncertainty. Whether local experiments take root depends on subsequent *selection* mechanisms, including market, institutional, social and environmental factors, which determine which variants are viable and will be further developed, and which will disappear (Boschma & Frenken, 2006; Martin & Sunley, 2006; Ma & Hassink, 2013; 2014). *Retention* then stabilises the selected solutions through investment, policy setting and institutional anchoring, thereby increasing the costs of change and gradually eliminating alternative development options. This leads to the emergence of *path-dependent* development trajectories for destinations (Martin & Sunley, 2006). According to evolutionary logic, development is neither linear nor optimal nor centrally controlled; rather, it is the result of experimentation by various actors, competition between alternative solutions and the subsequent institutionalisation of those that prove viable (Boschma & Frenken, 2006; Martin & Sunley, 2006). Unlike the TALC model, the evolutionary framework does not assume a universal sequence of development phases. Instead, it allows for multiple possible destination development trajectories, shaped by historical coincidences, political decisions, regulatory interventions and local reactions (Ma & Hassink, 2013; 2014; Hall, 2011; Brouder, 2020; Abe et al., 2024).

The central principle of path dependence is that development depends on previous decisions and events (Martin & Sunley, 2006; Sorensen, 2015; Brouder, 2020). In the context of tourism, this means that past investments in infrastructure, destination management strategies, environmental regulations and established tourism practices will significantly influence the future availability of certain development trajectories and the closure of others. Consequently, destinations cannot be examined in isolation from their historical and institutional context.

### **Conceptualizing path dependence in tourism: mechanisms, conditions, and consequences**

The *concept of path dependence* is one of the key theoretical frameworks in current tourism research, used to explain the long-term stability and rigidity of tourist destination development trajectories. The basic premise is that historical decisions, initial conditions and unexpected, time-bound events can influence the future direction of the system through cumulative mechanisms, with these influences being reproduced and amplified over time (Martin & Sunley, 2006; Sorensen, 2015; Abe et al., 2024). In tourism, path dependence does not manifest as a mechanical 'lock-in', but rather as *process dynamics* whereby past structures simultaneously enable and constrain new forms of development (Boschma & Frenken, 2006; Brouder, 2020). The key mechanism is *retention*, whereby certain tourism products, markets and management practices become established as a result of investments in infrastructure, policies, regulatory frameworks and organisational routines (Ma & Hassink, 2013; 2014). *Fixed and specialised investments*, especially in attractions, accommodation and transport infrastructure, play a particularly important role in this process, creating high costs for change and motivating actors to continue with the existing development model (Light et al., 2025). This process is further reinforced by *institutional inertia*, whereby the same forms of planning, marketing and tourism promotion are repeatedly reproduced, creating stable expectations and interests linked to the dominant trajectory (Hall, 2011; Sorensen, 2015). Path dependence in tourism also has a significant *socio-cultural dimension*. Symbolic representations of a destination, cultural heritage, local norms and identities can legitimise certain forms of tourism while delegitimising others, thereby significantly narrowing the scope for innovation (Matlovičová, 2024; Abe et al., 2024). Development trajectories are therefore not only an economic outcome, but also a product of social and political selection.

The literature on the evolutionary development of destinations emphasises that the strength of path dependence depends on the degree of destination specialisation, the diversity of stakeholders, and the flexibility of the institutional environment (Boschma, 2015). Destinations that are closely linked to a single dominant product or market tend to be more vulnerable to *lock-in effects* (Ma & Hassink, 2013; 2014). This is a situation in which accumulated investments, institutional rules and stakeholder interests increase the costs of change, thereby limiting the destination's ability to adapt to alternative development trajectories. In contrast, diversified destination systems demonstrate greater adaptive potential (Boschma, 2015; Martin & Sunley, 2006; Ma & Hassink, 2013; 2014).

In this regard, Boschma (2015) points out that strong *lock-in reduces the resilience* of tourist destinations, whereas diversified destination structures enable *path renewal or path creation*. However, he also notes that high specialisation can lead to path contraction in times of crisis. This occurs when the existing development path of a destination persists, but on a reduced, weakened or degraded scale without fundamental transformation to a new trajectory. *Actor agency* and *power relations* play a fundamental role in this case. Path dependence is not merely a passive consequence of the past; it can also be actively maintained by influential stakeholders who benefit from the current trajectory (Light et al., 2025).

Conversely, the public sector can play an active role in leading fundamental changes, particularly when accompanied by investments, changes in management and a redefinition of the destination's dominant narrative (Matlovičová, 2024; Abe et al., 2024). *Exogenous shocks* and *trigger events* deserve special attention in this context. The impact of the pandemic, economic crises or political changes can temporarily disrupt existing trajectories, creating *windows of opportunity* for *path renewal* or *path creation* (Matlovič & Matlovičová, 2024; 2025). However, numerous empirical studies show that shock alone does not guarantee transformation (Szilágyi et al., 2025). Without concurrent institutional innovation, there is often a return to the original growth path (Brouder, 2020; Light et al., 2025).

Path dependence can have mixed consequences in tourism. On the one hand, it contributes to stability, predictability and the efficient use of existing resources, thereby supporting the long-term competitiveness of a destination (Brouder, 2020). However, it can also increase vulnerability to crises, limit the ability to adapt and perpetuate suboptimal or environmentally unsustainable development models (Boschma, 2015; Brouder, 2020). Some authors (e.g. Martin & Sunley, 2006; Light et al., 2025) point out that the development of destinations cannot be understood solely as a transition between

stages of growth and decline, but as a *plurality of possible trajectories*, including *path extension*, *path renewal*, *path creation*, but also negative paths such as *path contraction* or *downgrading*. Unlike linear-cyclical models, concepts based on *path dependence* enable the analysis of nonlinearities, discontinuities and the long-term consequences of decision-makers' choices, which are only reflected to a limited extent in traditional models (such as TALC). These concepts provide a better understanding of situations in which destinations may not respond to challenges and external shocks by returning to growth, but instead by reorienting, diversifying or regulating the volume of tourism (Martin, 2010; Brouder, 2020). Current tourism research is increasingly focusing on sustainability and the quality of life for residents (Mousazadeh, 2022; Matlovičová et al., 2025), as well as issues of resilience (Szilágyi et al., 2025). This shifts the focus away from purely economic aspects of competitiveness and towards the broader social and environmental consequences of destination development (Hall & Page, 2014; Higgins-Desbiolles et al., 2019). The concepts of *regenerative* and *post-growth tourism* are emerging, challenging the imperative for constant growth in visitor numbers and emphasising the need to align tourism with ecological limits and local capacities (Cheer et al., 2019; Fletcher et al., 2020; Boros & Korcsmáros, 2024).

## AIMS AND OBJECTIVES

In the context of the theoretical considerations outlined above, the empirical part of this study focuses on Sikkim, a state in India. It is a notable case study of a tourist destination whose development has been significantly influenced by its geopolitical location and historical evolution. This has led to numerous regulations and access restrictions (many areas still face these today), environmental policies and a targeted focus on ecotourism and the sustainable development of the state. This study therefore aims to examine the development trajectories of tourism in Sikkim using two different approaches: the linear cyclical model of TALC and the path dependence approach.

The latter focuses on historical (especially political) decisions and contingent events (unexpected and time-bound) that have influenced the direction of Sikkim's development trajectories, and which are reproduced and reinforced over time through cumulative mechanisms. We also assess future challenges from the perspective of the destination's ability to adapt to external shocks and maintain the direction of the entire tourism system.

## DATA AND METHODS

The research focuses on the territory of the Indian state of Sikkim, which is located in the Himalayan region. Its location in north-eastern India, bordering China to the north, Bhutan to the east and Nepal to the west, and separated from Bangladesh by a narrow corridor of the Indian state of West Bengal, makes it an attractive tourist destination (Figure 1).

The area's potential for tourism development lies not only in its naturally valuable Himalayan environment, but also in its diverse religious and cultural heritage (Figure 1). The study takes an interdisciplinary approach to examining the current dynamics and prospects of sustainable development and tourism in Sikkim. The research methodology involves critically assessing existing government policies and legislative measures adopted for tourism development in the region.



Figure 1. Selected tourist attractions in Sikkim (Source: Santosh Sharma and Yograj Sharma, private archive) 1: Lachen - a base village for visiting Gurudongmar Lake; 2: Gurudongmar Lake, North Sikkim; 3: Yumthang Valley, North Sikkim; 4: Changu Lake, East Sikkim; 5: Chardham, Namchi, South Sikkim; 6: Buddha Park, Ravangla, South Sikkim; 7: Mt Kanchenzonga from Tinjurey(Fambhonglho Wildlife Sanctuary), East Sikkim; 8: Ban Jhakri falls – One of the Tourist spot of Gangtok, East Sikkim; 9: Rumtek Monastery, East Sikkim

Data on visitor numbers to Sikkim between 1993 and 2024 was obtained from the Sikkim Government's Department of Tourism (GOAR, 2011; GOS, 2018; GOAR, 2024; GOAR, 2025). A quantitative approach was employed to analyse visitor numbers in the region, with graphical visualisations of trends providing greater clarity. The aim of the comparative analysis is to evaluate growth in visitor numbers in Sikkim over ten-year periods using the compound annual growth rate (CAGR).

$$CAGR (\%) = \left( \left( \frac{V_k}{V_0} \right)^{\frac{1}{n}} - 1 \right) \cdot 100 \quad (1)$$

where:

$V_0$  is the visitor number value at the beginning of the observed period,

$V_k$  is the visitor number value at the end of the observed period,

$n$  is the number of observed periods (years),

$\frac{V_k}{V_0}$  is the growth ratio of the final value to the initial value,

$\left( \frac{V_k}{V_0} \right)^{\frac{1}{n}}$  is the multiplicative annual growth factor (geometric mean growth factor).

We applied a scenario-based modelling approach that combines exponential growth forecasting with capacity-constrained logistic projections to estimate future tourist flow in Sikkim until 2045. This approach reflects the historical dynamics of tourism demand growth and the growing influence of regulatory and environmental constraints on destination development. First, an unregulated growth scenario was calculated using an exponential growth model based on the compound annual growth rate (CAGR). This model serves as a benchmark representing continued expansion without capacity constraints (2; Witt & Song 2001; Song & Li, 2008):

$$V_t = V_0(1 + r)^n \quad (2)$$

where:

$V_t$  is the number of visitors in year t,

$V_0$  is the observed value in 2025,

$R$  is the average annual growth rate,

$n$  representing the number of years after the base year (t–2025).

To account for sustainability limits and institutional regulations, alternative scenarios (highly regulated and cautious, with moderate growth) were modelled using a logistic growth framework that incorporated carrying capacity (K). Carrying capacity was derived from accommodation supply data reported in the *Sikkim Tourism Policy* (2018), which provides figures for 34,133 beds and 16,945 rooms. As total visitor numbers include both overnight tourists and one-day visitors, annual carrying capacity was estimated by adjusting accommodation capacity using three parameters: average bed occupancy ( $O_c$ ), average length of stay ( $A_l$ ) and proportion of visitors requiring accommodation ( $p$ ). The carrying capacity was calculated as follows (3; Coccossis & Mexa, 2004; Manning, 2007).

$$K = \frac{B \cdot O_c \cdot D}{A_l \cdot p} \quad (3)$$

where:

$B$  denotes the number of beds,

$O_c$  is average occupancy rate,

$A_l$  is average length of stay in nights,

$p$  is the share of overnight visitors,

$D$  is defined as the effective number of tourism operating days per year, whereas 365 days represents an upper-bound theoretical estimate.

We have then defined three K-scenarios as follows:

(1) *Regulated growth* (strong ecological limits):  $O_c = 0.35$ ,  $A_l = 3.0$ ,  $p = 0.70$ , resulting in K=approx 2.1 million visitors per year.

(2) *Cautious scenario* (moderate sustainability-oriented growth) - capacity-managed growth:  $O_c = 0.45$ ,  $A_l = 2.5$ ,  $p = 0.60$ , resulting in K=approx 3.7 million visitors per year.

(3) *Exponential growth* (intensive use): unregulated growth without setting an upper limit on capacity (intensive use without a capacity boundary):  $O_c = 0.55$ ,  $A_l = 2.2$ ,  $p = 0.50$ , resulting in K=approx 6.2 million visitors per year (used for sensitivity testing only. This scenario (3) is modeled as exponential growth without a ceiling).

The future trajectories under the regulated and cautious scenarios we projected using a discrete logistic growth model (4; Verhulst, 1838; Gotelli, 2008; Zhong et al., 2011).

$$V_{t+1} = V_t + gV_t \left( 1 - \frac{V_t}{K} \right) \quad (4)$$

where:

$V_t$  is visitor volume in year t,

$K$  is the carrying capacity derived above,

$g$  represents the intrinsic growth parameter.

The  $g$  parameter was calibrated (5) so that the initial post-2025 growth rate corresponded to the government of Sikkim's policy-oriented targets (Gotelli, 2008; Tsoularis & Wallace, 2002).

$$g = \frac{y}{1 - \frac{V_0}{K}} \quad (5)$$

with  $\gamma=3,5\%$  for the regulated scenario and  $\gamma=6\%$  for the cautious scenario.

Using the above approach, we created three possible scenarios for visitor growth to Sikkim that can be compared:

- (1) a regulated logistic trajectory approaching or falling below ecological limits.
- (2) a cautious, sustainability-oriented trajectory that converges towards a ecological threshold;
- (3) an unregulated exponential growth trajectory, which is unregulated growth without setting an upper limit on capacity (intensive use).

We then presented the results in numerical and graphical form to clearly demonstrate the difference between paths of unlimited growth and development based on sustainable growth.

## RESULTS AND DISCUSSION

### Pattern of tourist inflows in Sikkim (1994-2024)

The economic structure of the Indian state of Sikkim is largely determined by tourism revenues, which are growing in importance year on year. This is evident from the almost sevenfold increase in the average number of visitors over the past 30 years, rising from 92,435 in 1994 to 1,321,169 in 2023 (Ministry of Tourism, GoI, 2024; see Table 1). The most significant natural factor reducing visitor numbers in Sikkim is the summer monsoon rains, which are accompanied by frequent landslides and difficult travel conditions, especially in July ( $\bar{x}=18\ 960$ ) and August ( $\bar{x}=19\ 117$ ).

This is when visitor numbers reach their lowest level of the year (Table 1). Conversely, May is the month with the highest average number of visitors (almost 105,520, of whom 103,500 are domestic), followed by April. One factor that boosts the influx of domestic visitors in these months is the summer holidays in India, when families with children in particular seek out regional festivals and the pleasant spring weather in Sikkim's cooler mountainous areas. The curve of foreign tourist visits differs significantly from that of domestic visitors (see Table 1). The highest average number of visits occurs in October ( $\bar{x}_{1994-2023}=4\ 423$ ). This period, which follows the end of the monsoon season, offers ideal conditions for popular forms of nature and cultural tourism, especially trekking and festival tourism. The annual growth rate (CAGR) indicates strong growth, with domestic tourism growing by an average of 9.61% per year and foreign tourism by an average of 9.43% (Table 1). The highest CAGR for domestic tourism is recorded in January (15.73%) and March (14.80%), due to the winter holidays and the earlier arrival of spring. The greatest variability in domestic visitor numbers occurs in May, with standard deviation (SD) values of just over 90,130. The lowest seasonality rates occur in August and July (Table 1). The visitor curve for foreign visitors has less pronounced extreme values during the year, with maximum SD values occurring in October ( $SD_{max}=4\ 503$ ) and minimum SD values in July ( $SD_{min}=1\ 436$ ; Table 1).

Table 1. Descriptive statistics of tourist visits to Sikkim, India (1994-2023) (Source: GoI, 2024; data processed by the authors)

Month	Domestic Tourist				Foreign Tourist				Overall			
	$\bar{x}^*$	$R_K^{**}$	$SD^{***}$	$CAGR^{****}$	$\bar{x}^*$	$R_K^{**}$	$SD^{***}$	$CAGR^{****}$	$\bar{x}^*$	$R_K^{**}$	$SD^{***}$	$CAGR^{****}$
January	40475.03	VIII	43441.48	15.73%	2269.10	VII	3148.73	10.34%	42744.13	VIII	45892.41	15.01%
February	35937.40	IX	38011.86	10.90%	2293.83	VI	2828.35	11.84%	38231.23	IX	39515.26	11.05%
March	51534.53	IV	49444.38	14.80%	3121.20	IV	2964.96	10.58%	54655.73	IV	51637.63	14.34%
April	75544.53	II	76541.86	9.49%	3687.87	II	3628.44	8.26%	79232.40	II	79543.97	9.39%
May	103497.67	I	90131.67	8.99%	2014.53	VIII	1978.28	9.23%	105512.20	I	91730.08	9.00%
June	54589.57	III	57072.15	4.88%	1512.53	X	2667.11	7.87%	56102.10	III	59342.81	5.07%
July	17908.80	XI	15319.05	11.37%	1050.70	XII	1436.04	10.83%	18959.50	XII	16620.43	11.32%
August	17899.37	XII	14858.94	10.56%	1217.97	XI	1574.12	7.89%	19117.33	XI	15703.87	10.35%
September	24336.87	X	22627.63	11.43%	1613.37	IX	1510.04	9.35%	25950.23	X	23817.97	11.28%
October	47229.12	V	44717.73	2.90%	4423.00	I	4803.02	7.20%	51652.02	V	48264.11	3.11%
November	43329.70	VII	42912.95	10.68%	3529.23	III	3757.13	8.67%	46858.93	VII	44805.94	10.53%
December	44990.33	VI	39124.90	10.80%	2865.17	V	3890.69	10.27%	47855.50	VI	42033.09	10.76%
Total	557272.80	-	443967.09	9.61%	29598.50	-	30213.09	9.43%	586871.3	-	470345.9	9.59%

\*  $\bar{x}$  - average monthly tourist arrivals; \*\*  $R_K$  - rank of individual months according to the average number of tourist arrivals; \*\*\* SD - standard deviation; \*\*\*\* CAGR - compound annual growth rate.

The ten-year trend in visitor numbers (Table 2, Figure 2) is generally upwards, with significant acceleration in growth, particularly over the last decade (2014–2023). This period was characterised by the global outbreak of the SARS-CoV-2 virus, which resulted in a significant drop in visitor numbers in 2020.

However, the following two years saw a rapid recovery in visitor numbers, exceeding those of the pre-pandemic year of 2019. We attribute the slight decline in visitor numbers in 2023 to the concurrent global crises referred to as a 'polycrisis' (see Matlovič & Matlovičová, 2024), which are increasing uncertainty in tourist markets.

Table 2. Decadal tourist visit in Sikkim (foreign + domestic) (Source: GoI, 2024; data processed by the authors)

Descriptive statistics	DECADAL BREAK		
	1994-2003 (D1)	2004-2013 (D2)	2014-2023 (D3)
$\bar{x}$	175522.90	524293.20	1060797.80
SD	39649.26	128538.26	502812.77
CAGR	9.87%	8.17%	9.77%

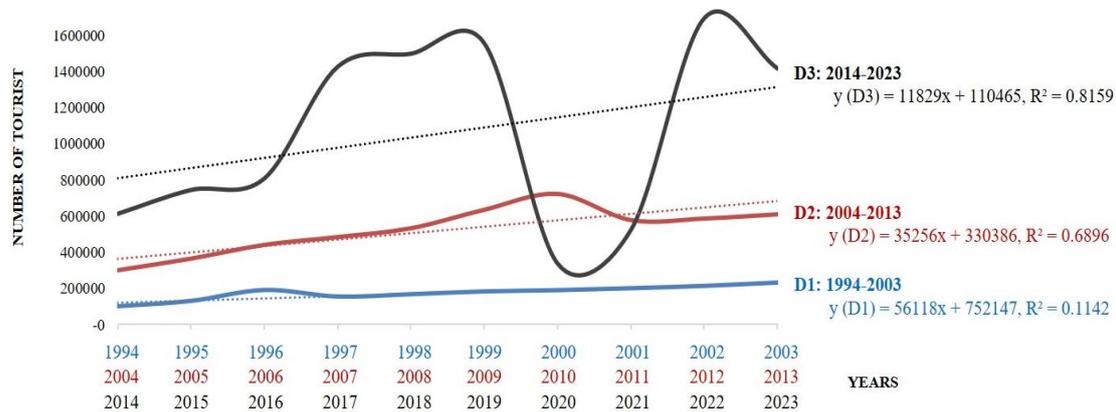


Figure 2. Decadal inflow of tourists in Sikkim (Source: GoI, 2024; data processed, calculated and visualized by the authors)

### Tourism development in Sikkim: TALC model

1. *Exploration (1975-1990)*: Before 1975, tourism in the northern Indian state of Sikkim, located in the eastern Himalayas, was only a marginal part of the national economy. Small groups of visitors, mainly trekkers and mountaineers, were attracted by the rugged mountain terrain, as well as by Buddhist pilgrimage sites, especially those in neighbouring Tibet, Bhutan and Nepal. Popular destinations included the monasteries of Rumtek, Pemayangtse and Tashiding. In this case, however, the sacred function prevailed over the recreational one. In the context of Butler's classic linear model, the Tourism Area Life Cycle (TALC; 1980), the 1980s could be considered the initial phase of 'discovering' Sikkim as a tourist destination. A significant milestone was reached in 1975 when the monarchy was abolished and Sikkim became a part of India. This was followed by measures aimed at opening up the country to visitors. For instance, in 1988, the state government lifted restrictions on movement around the high-altitude Tsomgo (Chhangu) lake, opening it up to both domestic and foreign visitors. In the 1980s, the Sikkim government began gradually improving conditions for tourism development, primarily by amending legal regulations to ease travel restrictions for the general public within the state. The subsequent development of transport and accommodation infrastructure stimulated demand, particularly from domestic Indian tourists. Subsequently, the newly established Ministry of Tourism adopted a policy of focusing on specific forms of tourism, particularly rural and ecotourism (Chakraborty & Ghoshal, 2024). Targeted support for tourism development resulted in a gradual increase in visitor numbers, reaching 19,115 domestic and 2,739 foreign tourists in 1981 (Chakrabarti, 2014).

However, the development of tourism as a means of diversifying the local economy was slowed down between 1980 and 1985 due to unrest, primarily driven by the separatist efforts of the *Gorkha National Liberation Front*. This group sought to establish an independent state of Gorkhaland in the adjacent territories on the southern border of Sikkim, specifically in the Darjeeling and Kalimpong districts of the Indian state of West Bengal, as well as in the Siliguri Corridor - a narrow strip of land approximately 21–22 km wide between Nepal, Bangladesh, and Bhutan. Consequently, tourism in Sikkim declined significantly. Until 1990, the movement of tourists within the state was severely restricted by the '*inland pass system*'.

2. *Involvement (1990-2000)*: In 1991, a new economic development strategy was formulated which lifted restrictions on foreign tourist movement and investment in the state. Interest in Sikkim increased, resulting in the accelerated development of basic tourist services, such as local communities offering private accommodation (homestays). Even at this early stage in the development of tourism, the government sought to regulate it by actively promoting sustainable forms of tourism. As part of opening Sikkim up to domestic and foreign tourists alike, a series of government awareness campaigns and training courses were launched between 1995 and 1996. These aimed to raise awareness of the impact of inappropriate tourism development on sensitive mountain ecosystems in protected areas, as well as introducing a set of regulatory measures to protect these areas. The importance of these activities became apparent in 1997 when exceptionally heavy rains hit the area, resulting in landslides in Gangtok. The following year, in 1998, the *State Tourism Development Corporation* was established to support activities aimed at sustainable tourism development.

3. *Development (2000-ongoing)*: At the beginning of the new millennium, a new five-year development plan for the state of Sikkim was adopted for the period 2002–2007 (GOS, 2007). Within this plan, tourism was designated as a preferred economic sector. The state's main priorities were therefore to develop basic infrastructure, strengthen national identity by promoting region-specific handicraft production and support human resource development. Since 2006, tourism has become the dominant sector of the state's economy (Chakraborty & Ghosal, 2024; Dam, 2013). A sign of a change in the orientation of tourism development in Sikkim came in 2003 with the official government decision to transition to organic farming in agriculture. In 2011, the tourism development policy aimed to make *Sikkim an ecotourism destination* (Policy, 2011). At least one such destination was planned for each of the 32 constituencies (Joshi & Dhyani, 2009). Marketing communications and the promotion of sustainable natural products (e.g. birdwatching, trekking, mountaineering and rafting) and cultural tourism (particularly religious tourism) were adapted to this end. Increased investment in tourism infrastructure, particularly transport infrastructure (e.g. cable cars and suspended walkways), the restoration of religious monuments<sup>1</sup> and the development of accommodation facilities supported this goal. The government also paid equal

<sup>1</sup> In this case, it concerned investments in pilgrimage and tourist sites with a predominantly symbolic and representative function in southern Sikkim (e.g., the Guru Padmasambhava monument in Namchi, the Char Dham complex, and Buddha Park in Ravongle).

attention to human resource development and capacity building for local tourism sector stakeholders, particularly supporting the training of tour guides in relation to opening up new tourist destinations<sup>2</sup>.

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From 2011 to 2016, Sikkim experienced a high degree of political stability, characterised by long-term government continuity, an absence of armed conflicts and a predictable institutional environment. These favourable conditions created an ideal setting for the development of tourism<sup>3</sup>. This period is also referred to as the *ecological turning point* in Sikkim's development. In addition to the aforementioned factors, the implementation of a well-considered eco-tourism development policy, coupled with investments in infrastructure development — particularly road construction and the opening of new tourist destinations — and a well-considered marketing strategy, contributed to this significant milestone in the region's tourism development (Newpaney & Lee, 2016). The current state of tourism in Sikkim clearly reflects Butler's "development" phase, characterised by rapid growth in visitor numbers, significant infrastructure expansion and active market promotion (Table 3; Figure 3). Over the past decade, the state has seen an increase in domestic visitors, particularly since the opening of Pakyong Airport in 2018, as well as growing interest from international markets, especially in Southeast Asia and Europe. This growth has been supported by improved road access to popular destinations such as Nathula Pass and Tsomgo Lake, an increase in eco-resorts and private accommodation options, and the promotion of major events such as the International Flower Festival, as well as local festivals like Losar and Saga Dawa. The Sikkim government has confirmed its institutional commitment to expanding the sustainable tourism sector through *The Sikkim State Tourism Policy* (2018), which emphasizes a responsible, inclusive, and eco-friendly approach to its development. The policy declares special support for the development of adventure ecotourism trekking routes and themed tourist trails that focus on exploring the region's cultural heritage. This focus is supported by targeted marketing communications, especially digital campaigns, that promote Sikkim as a 'clean and green' destination. The inclusion of *Khangchendzonga National Park* on the UNESCO World Natural Heritage List in 2016 and the recognition of Gangtok as one of the cleanest cities in India in 2018 have aided this goal. Strategic partnerships have also been established with travel agencies specialising in ecotourism, particularly adventure trekking tours and birdwatching, as well as cultural tourism and wellness stays.

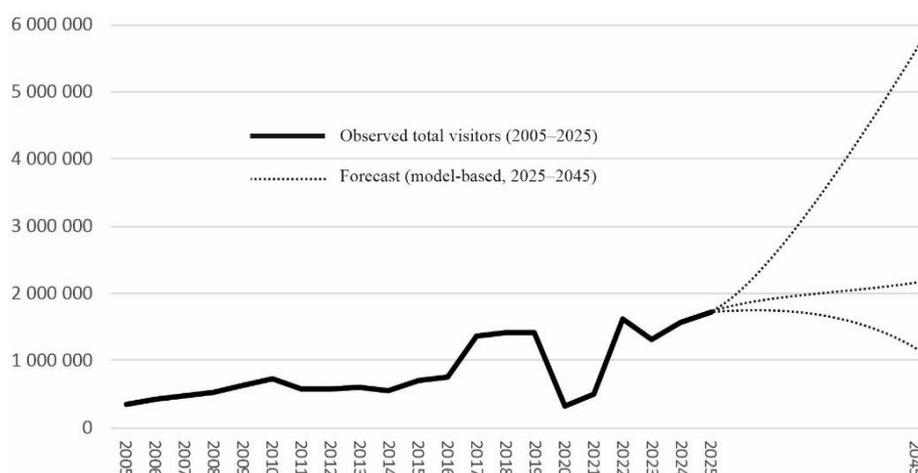


Figure 3. Possible scenarios for visitor numbers based on the TALC model  
(Source: GoI, 2024; GOAR, 2024; data processed, calculated and visualized by the authors)

<sup>2</sup> The initial phase of 'opening up' areas that had previously been inaccessible for security reasons began in 2006 with the opening of the *Nathula Pass* on the historic Silk Road connecting India and Tibet to domestic tourists. This signalled a more favourable atmosphere for opening up other areas to tourism (Joshi & Dhyani, 2009). It provided impetus for the expansion of permits issued to domestic tourists to enter sensitive areas in northern and eastern Sikkim, such as the Lake Gurudongmar area, the Yumthang Valley of Flowers and the high-altitude Yumesamdong location in the north (the endpoint of the road close to the Tibetan border, known as Zero Point), as well as the viewpoint on the historic Silk Road near the high-altitude village of Zuluk in eastern Sikkim, and some areas in western Sikkim (as of 1 December 2024).

<sup>3</sup> The positive development trend was not halted even by the strong earthquake in 2011 (Mw 6.9), which caused serious damage to tourism infrastructure and triggered local landslides in the affected areas of Sikkim. Landslides and GLOF (*Glacial Lake Outburst Floods*) phenomena form an interconnected hazard system in the Himalayan environment, in which they can act as both the cause and consequence of each other (Mukul, 2024). According to Mukul (2024), tectonic stress has accumulated in some areas of the Himalayas over a long period of time, which has not been released by a major earthquake, and therefore another strong seismic event is expected in the Indian Himalayas.

Table 3. Development Stage Indicators in Sikkim (Source: Authors' compilation)

Sl. NO.	Development	Feature Example
1	Rising tourist arrivals	Post-2016 growth, record numbers in 2022–23
2	Infrastructure expansion	Pakyong Airport 2018, upgraded roads, eco-resorts
3	Government promotion	Sikkim Tourism Policy 2018, national campaigns
4	New markets & products	Bird-watching, monastery circuits, adventure trekking
5	Investment from outside	Hotel chains and travel operators entering market

Sikkim's popularity as a tourist destination is growing, as it offers an alternative to overcrowded places such as Manali and Shimla in the western Himalayas. While some areas, such as MG Marg in Gangtok, already experience overcrowding during the high season, there are still destinations with the potential for further sustainable growth in tourism, such as Dzongu (northern Sikkim), Zuluk (eastern Sikkim) and Yuksom (western Sikkim). Specifically, popular trekking routes such as the Goecha La and Dzongri trails, as well as community accommodation in Dzongu and Yuksom, remain uncrowded. However, the ongoing expansion of *community-based ekotourism* initiatives and product diversification, particularly in *wellness tourism*, *birdwatching* and *eco-agritourism*, into underdeveloped regions of Sikkim, does not yet have the character of mass tourism.

### Interpretation of Sikkim's tourism development from evolutionary and path-dependent perspectives

Evolutionary and path-dependent approaches enable us to interpret the development of tourism in Sikkim as the result of historically conditioned decisions and cumulative mechanisms that have gradually stabilised the destination's specific developmental trajectory, rather than as a mechanical and universal cycle of growth. Sikkim's development was shaped by a series of events, institutional interventions and political decisions that influenced the direction of tourism development at pivotal moments (e.g. the ecological turnaround in 2011), subsequently being reproduced through retention mechanisms (e.g. the adoption of the *Sikkim State Tourism Policy* in 2018).

One of the key path-dependent mechanisms was the historical regulation of access to the region due to its geopolitical position. Examples include the restrictions imposed after 1950 and the phase of relative stability associated with the 'opening' in 2006 and 2011–2016. The long-term implementation of a permit system, the closure of extensive border regions and the geopolitical sensitivity of its proximity to the Tibetan border significantly restricted visitor numbers, effectively preventing the onset of mass tourism that occurred in other Indian regions (GOAR, 2011; Joshi & Dhyani, 2009). These initial conditions fundamentally impacted the development trajectory of tourism in Sikkim, resulting in a focus on low-volume forms such as trekking, religious pilgrimages and nature-oriented tourism for small groups, rather than the rapid expansion of mass tourism typical of other Himalayan destinations.

Political decisions can be viewed as *critical junctures* in the context of historical institutionalism (Mahoney, 2000; Sorensen, 2015) and played a pivotal role in shaping Sikkim's developmental path. A significant turning point in Sikkim's tourism development was the 2003 decision to promote environmentally friendly agriculture, followed by further measures (see below). These measures not only redefined the destination's identity, but also steered its development in a new direction towards an environmentally oriented tourism model, gradually 'locking' Sikkim into a specific path of ecotourism and cultural heritage development (GOAR, 2011; 2018). Currently, this trajectory undergoes a process of *retention* and *institutional embedding* through targeted investments in tourism infrastructure (e.g., cable cars, eco-oriented resorts, pilgrimage and tourist complexes, monasteries, and themed tourist routes). In parallel, a marketing narrative of "*clean and green destination*" is being developed, which aims to strengthen the symbolic identity of Sikkim as a destination specifically focused on ecotourism products (GOS, 2018). Finally, this trajectory is also supported by legislative and strategic documents that have created regulatory frameworks for environmentally sustainable tourism development in Sikkim, ensuring its *retention* and *institutional embedding*. Specifically, the 2011 *Ecotourism Policy* was adopted in 2011 with the aim of protecting natural and cultural heritage, promoting responsible tourism, strengthening local communities and ensuring quality experiences for visitors. Furthermore, the *Sikkim Ecotourism Council* (SEC) was established to coordinate the implementation of strategies, including targeted marketing support focused on ecotourism. A key initiative of the Directorate of Ecotourism (DoE) within the Department of Tourism & Civil Aviation of the Government of Sikkim was the establishment of 11 *Ecotourism Zones of Sikkim* in 2008. This was done with the aim of strictly regulating tourism development.

The Sikkim Homestay Establishment Registration Regulations of 2013, introduced the building of more than 700 homestays in various Sikkim villages, encouraging the growth of sustainable rural tourism and community-based ecotourism in the region (GOS, 2018). The potential, characteristics and cultural components of homestays have been conceptualised by Sikkim Himalayan Homestays in collaboration with the Ecotourism Society of Sikkim (ECCOSS), an NGO. The development of operational modalities and capacity-building programmes for local communities has also been undertaken (Yadav et al., 2018). The declaration of Sikkim as India's first '100% green state' in 2016 was also significant in supporting efforts to transform Sikkim into an ecotourism destination. In 2018, the *Sikkim Tourism Policy* was adopted.

From an evolutionary and path-dependent perspective, this can be seen as a measure aimed at *retaining* and *institutionally embedding* the ecotourism trajectory. The *Sikkim Tourism Policy* (2018) specifically defines tourism as a key driver of economic growth and job creation, achieved by supporting the private sector, engaging local communities, and developing the necessary infrastructure. Particular focus is given to ecotourism and the sustainable growth of the sector, including the establishment of regulatory frameworks. These institutionalised processes result in the stabilisation of a development trajectory based on the regulated sustainable use of natural resources and socio-cultural capital.

From an evolutionary economic geographical perspective, this is an example of path dependence, whereby initial political decisions and institutional settings were gradually reproduced through targeted investments, rule-setting and regulations, in order to limit the scope for alternative development paths. Thus, the development of tourism in Sikkim can be interpreted as a historically specific evolutionary trajectory shaped by geopolitical constraints, environmental policies and the institutionalisation of an ecologically oriented development model. According to the latest data available from the Government of Sikkim's Tourism & Civil Aviation Department (GOAR, 2025), Sikkim's tourism sector has experienced a notable recovery since the pandemic, with over 1.7 million visitors recorded in 2025. This growth built on the 2024 figure of approximately 1.63 million tourists (GOAR, 2025). This was primarily driven by domestic tourism, which had almost returned to pre-pandemic levels by 2023 and continued to grow in 2024 and 2025, particularly during the peak seasons of April–May and October–December. Foreign tourism also gradually recovered after a significant decline in 2020–21, with over 60,000 visitors recorded in 2025, although this figure still did not reach pre-pandemic levels. These developments highlight the resilience of the tourism sector in Sikkim and its growing importance as a year-round tourist destination.

Table 4. Projected growth in visitor numbers (selected years)  
(Source: GoI, 2024; GOAR, 2024; GOAR, 2025; data processed, calculated and visualized by the authors)

Year	Regulated growth logist. Trajectory $K \approx 2.08M$	Moderate growth logist. Trajectory $K \approx 3.74M$	Unregulated exponential growth (8% exp.)
2025	1,712,360	1,712,360	1,712,360
2030	1,937,003	2,226,175	2,516,019
2035	2,027,932	2,695,751	3,696,857
2040	2,060,180	3,067,714	5,431,896
2045	<b>2,071,053</b>	<b>3,329,198</b>	<b>7,981,237</b>

Based on the accommodation capacity stated in the *Sikkim Tourism Policy 2018* (34,133 beds; 16,945 rooms), carrying capacity  $K$  (annual visitor ceiling) were derived (for more see methodology). Since the total number of visitors also includes a proportion of one-day visits without overnight stays, the bed capacity of accommodation establishments was transformed into an annual visitor ceiling using the proportion of overnight stays. The result is three capacity scenarios representing different modes of destination use (strictly regulated vs. moderately regulated vs. unregulated; Figure 4, Table 4). More specifically:

(1) Regulated logistic trajectory – a trajectory of regulated growth that approaches the ecological limit ( $K_{approx.} = 2.1$  mil. visitors, or below it). Since visitor numbers in 2025 are relatively close to the ecologically strictly defined limit ( $K_{approx.} = 2.1$  mil. visitors), the trend line (Figure 4) is rapidly "breaking" and will stabilize at around 2.07 million visitors by 2045 as a result of strong ecological regulation and restrictions (rigorous entry limits and quotas, permit entry regimes, redirection of tourist flows and dispersion of visitors outside hotspots, emphasis on "high-value, low-impact").

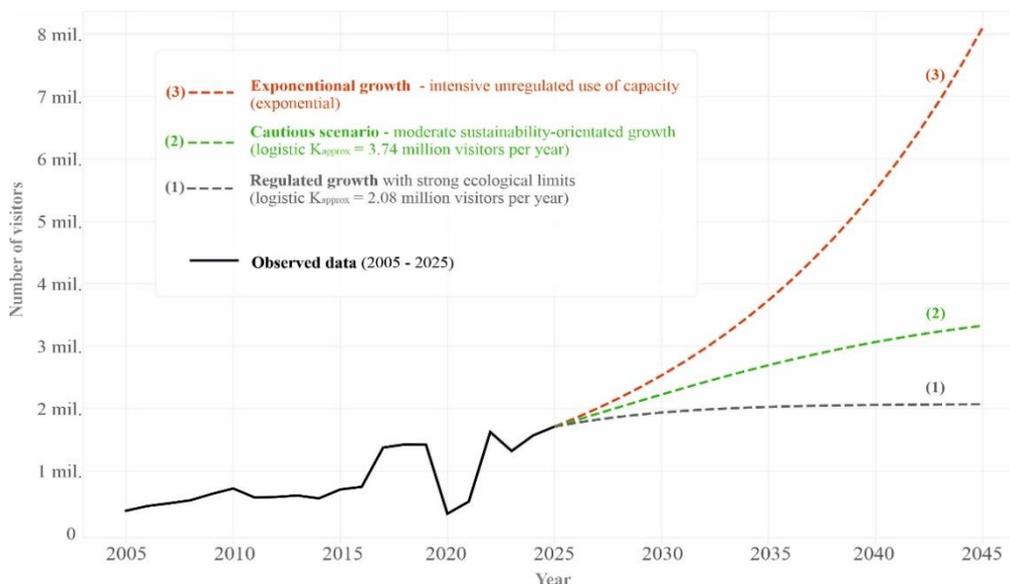


Figure 4. Possible scenarios for growth in visitor numbers to Sikkim – estimate for 2045  
(Source: GoI, 2024; GOAR, 2024; GOAR, 2025; data processed, calculated and visualized by the authors)

(2) Cautious sustainability-oriented logistic trajectory – cautious (moderately regulated) growth converging towards a higher threshold ( $K_{approx.} = 3.7$  mil. visitors). The number of visitors grows relatively fast in the first few years, but gradually slows down and approaches the threshold of 3.3 million by 2045, thus converging towards the threshold of 3.7 million. This trajectory represents a path of sustainable development shaped by institutional mechanisms for regulating capacity, diversifying visitor flow, and adaptive governance.

(3) Unregulated exponential growth trajectory – Unregulated exponential growth without setting a capacity ceiling (intensive use). In this case, visitor numbers grow exponentially, reaching approximately 8.0 million visitors by 2045. Such a development assumes that the destination will not be practically hampered by capacity constraints (either

ecological or infrastructural). In the context of Sikkim, this would mean a significantly increased risk of congestion in transport corridors and hotspots (Tsomgo, Nathula, Yumthang), pressure on drinking water resources, waste management, the quality of the tourist experience, the lives of residents, and more.

The Government of Sikkim recognises that a substantial increase in visitor numbers could have significant negative environmental and socio-cultural impacts. In recent years, it has therefore adopted additional regulatory measures to support the established trajectory of sustainable tourism development. In March 2025, an entry fee of 50 rupees per tourist was introduced to regulate visitor numbers and generate revenue for the restoration and improvement of tourism infrastructure. In 2024, the *Sikkim Registration of Tourist Trade Act (2024)* was adopted, obliging tourism entities to register and regulating tariffs to ensure quality services and protect tourists' interests. It supports rural ecotourism products in particular, aiming to strengthen the position of local communities and protect cultural heritage by acting as a catalyst for sustainable development in peripheral areas (e.g. by supporting local ecotourism festivals in the villages of Yuksom, Dzongu, and Uttarey). Capacity building in ecotourism and adventure tourism is supported by institutions such as the *Sikkim Institute of Tourism and Hospitality Management (SITHM)*, SAATO, and training programmes run by JICA and the *State Rural Development Department*. Meanwhile, environmental protection has been bolstered through initiatives in solid waste and plastic management under the *Swachh Bharat Mission*, which involve NGOs and stakeholders in awareness campaigns and clean-up initiatives.

The state's rich biodiversity, which is home to rare species such as the red panda and snow leopard, has become a key tourist attraction, encouraging low-impact activities such as birdwatching, nature trails and ethno-botanical tours. These initiatives are supported by the *Sikkim Ecotourism Policy and State Biodiversity Action Plan*, and together they promote 'high-value, low-impact' tourism that respects ecological limits and fosters inclusive growth. Although the state has implemented steps such as prohibiting single-use plastics and encouraging organic agriculture, more extensive approaches are required for long-term viability (Gachuiwo et al., 2025; Karlin, 2025). Sikkim's infrastructure has been put under strain by the rapid influx of tourists, resulting in environmental degradation, cultural erosion, and resource depletion. Tourist hotspots such as Gangtok, Tsomgo Lake and Yumthang Valley suffer from issues like traffic congestion, unregulated trekking, waste accumulation and vehicle pollution, highlighting serious management shortcomings (Gachuiwo et al., 2025). The development of tourism infrastructure is also linked to deforestation.

For instance, a recent study (Chakraborty & Ghosal, 2022) found that insufficient regulation of tourism development has already caused environmental imbalances in the western part of the Indian Himalayan Region (IHR). One effective step recently taken by the Government of Sikkim is the ban on the use of single-use plastic water bottles with a capacity of less than two litres, as set out in notification no. 135/GOS/F&D/PCCF – ACS. 29/12/2021. The *Lachen Tourism Development Committee* in North Sikkim has introduced bamboo bottles as an alternative to plastic water bottles.

NGOs such as the *Eco-Tourism and Conservation Society of Sikkim (ECOSS)*, *Tsomgo Pokhori, Sureksha Sangrakchan Samiti (TPSSS)* on J.N. Road in Tsomgo and the *Kanchenzonga Conservation Committee (KCC)* in West Sikkim are actively involved in conserving natural and cultural resources. They do this by organising clean-up initiatives, awareness campaigns and skills development programmes, with the aim of minimising waste management levels in tourist destinations. The increasing popularity of high-altitude scenic sites like Gurudongmar and Yumthang is reflected in the record-breaking visits that were recorded in 2023 (Table 5). Yumthang stands out as the key site for foreign tourists, especially after 2018, while Nathula shows more moderate but steady growth. The impact of the COVID-19 pandemic in 2020 is unmistakable, causing a collapse in arrivals across all sites. However, the rapid post-pandemic recovery especially in 2023 highlights Sikkim's resilience as a tourist destination and growing domestic travel demand. Looking ahead, the challenge lies in ensuring sustainable tourism management, as footfalls in sensitive ecological areas like Yumthang and Gurudongmar could strain infrastructure and natural resources if unchecked.

Table 5. Trends of Tourism in recent decade (2011-2024) High-Altitude Destinations  
(Source: GoI, 2024; GoIT, 2024; GOAR, 2024; GOAR, 2025; data processed by the authors)

Location	Domestic (D) Foreign (F) Tourists	Min (Year)	Max (Year)	$\bar{x}$ per year	Notable Observations
Nathula	D	34,902 (2020)	814,067 (2023)	~135,000	Strong fluctuations, steep rise post-COVID in 2023
Gurudongmar	D	15,901 (2020)	1,221,753 (2023)	~175,000	Relatively stable until 2017, then sudden explosion by 2023
Yumthang	D	36,251 (2020)	1,506,644 (2023)	~260,000	Consistent growth trend, hitting peak in 2023
Yumthang	F	148 (2021)	46,965 (2023)	~7,000	Small segment overall, with sharp spike after COVID
Changu/ Baba Mandir	D	100,435 (2020)	5,674,966 (2023)	~900,000	Always the leading destination, dominates Sikkim's domestic tourism
Changu/ Baba Mandir	F	1,386 (2011)	90,134 (2023)	~17,000	Steady growth, with record foreign arrivals in 2023

The strategies for sustainable tourism development in Sikkim is presented in Table 6. The key stakeholders to be involved in this regard are *Sikkim Tourism Department*, Gram Panchayats & Local Bodies, Environmental NGOs, Youth & Education Institutions, Private Sector (Hotels, Travel Operators), National Policy Bodies (e.g., Ministry of Tourism, MoEF).

Table 6. Strategies for Sustainable Tourism Development in Sikkim (Source: Authors' compilation)

	GOALS	ACTIONS
<b>Environmental Sustainability</b>	Minimize ecological footprint	<b>Eco-Zoning:</b> Classify regions into high, moderate, and low-impact tourism zones. Restrict or ban access to fragile ecosystems.
	Conserve biodiversity	<b>Zero-Waste Tourism Program:</b> Enforce segregation, recycling, and composting at all tourist facilities.
	Protect natural and sacred sites	<b>Water Use Regulations:</b> Enforce water-efficient practices (e.g., low-flow showers, rainwater harvesting) in hotels and homestays. <b>Vehicle Caps:</b> Limit vehicular traffic in ecologically sensitive areas. Promote electric vehicles and shared transport.
<b>Economic Sustainability</b>	Maximize local benefits	<b>Support Community-Based Tourism (CBT):</b> Incentivize village homestays, local guides, and handicraft cooperatives.
	Ensure long-term viability	<b>Tourism Skills Programs:</b> Train youth in hospitality, language, and sustainable business practices.
	Reduce income disparity	<b>Limit Big Corporate Takeovers:</b> Restrict outside-owned mega resorts through zoning laws and land ownership limits. <b>Tourism Tax or Green Fee:</b> Charge every tourist a nominal fee for environmental upkeep and local welfare.
<b>Social &amp; Cultural Protection</b>	Preserve local identity and cohesion	<b>Heritage Site Management Plans:</b> Create carrying capacity limits and site-specific preservation guidelines.
	Promote cultural exchange, not exploitation	<b>Cultural Code of Conduct:</b> Educate tourists (via signage, guides, apps) on respectful behavior at religious/cultural sites.
		<b>Local Curriculum Reform:</b> Include tourism awareness and cultural pride in school education. <b>Festival Protection Grants:</b> Fund local festivals and rituals to maintain their authenticity.
<b>Infrastructure &amp; Planning</b>	Build resilient, future-ready tourism infrastructure	<b>Smart Tourism Master Plan (District-Level):</b> Integrated planning for roads, waste, water, and housing
	Avoid congestion and urban chaos	<b>Eco-friendly Transport:</b> Cable cars, walking trails, electric buses in high-density areas
		<b>Tourist Flow Diversion:</b> Promote lesser-known destinations to distribute tourist load <b>Digital Tourist Management:</b> QR-coded permits, pre-booked slots for attractions, real-time crowd data
<b>Governance &amp; Regulation</b>	Enforce laws effectively	<b>Tourism Task Force:</b> Special monitoring unit with police, forest, tourism, and panchayat officials
	Promote transparency and accountability	<b>Mandatory Impact Assessments:</b> All new tourism projects to undergo environmental and social impact checks
		<b>Grievance Redressal Platform:</b> Public portal for locals and tourists to report violations or exploitation <b>Local Governance Inclusion:</b> Involve Gram Panchayats and community councils in tourism decision-making

### Challenges for the future development of tourism in Sikkim

Over the next 20 years (until 2045), Sikkim will face several serious environmental, sociocultural and economic challenges. These challenges can already be identified as important determinants of future tourism development in the region.

**a) Environmental Challenges:** Sikkim's natural environment is one of the most valuable prerequisites for developing tourism in the state. Although the Eastern Himalayas, which form its core, are among the world's most important centres of biodiversity, they have experienced significant *deforestation* in recent decades (Sharma et al., 2025; Figure 5). Although the rate of deforestation here is lower than in western Indian Himalayan states, it is very likely that, unless there are fundamental changes in development, it will have the smallest area of forest cover of all the Himalayan states by 2100. This is partly due to its smaller size, but also because almost half of its territory lies above the upper forest limit (Pandit et al., 2007). According to the *Sikkim State Climate Change Action Plan* (2012), illegal logging and acquiring new land for infrastructure and tourism development projects are having a significant impact on forest degradation in Sikkim (Sharma et al., 2025). Studies focusing on land use changes in the Sikkim Himalayas over a 23-year period (1990–2013) at an altitude of 800–2,800 metres show that the volume of forest cover in warm deciduous forests has declined by more than 30 per cent, with primary forest areas being reduced by up to 16 per cent in total (Kanade & John, 2018). At the same time, an increase in secondary forest areas was recorded (Sharma et al., 2025). However, this does not represent a full ecological replacement for the loss of primary forests;

rather, it reflects natural succession processes in areas that were previously deforested or used for agricultural purposes, but were then abandoned due to infrastructure and settlement expansion (Kanade & John, 2018; Bytyqi et al., 2024).

Population growth, increasing urbanisation and deforestation are considered the most significant negative factors in the degradation of forest cover in the Sikkim Himalayas (Banerjee et al., 2019). Sikkim's forest cover decreased by 2% between 2011 and 2021 (Pradhan et al., 2022). A study by Sharma & Kumar (2025) showed that, over the two-decade period from 2000 to 2020, there was a reduction in vegetation cover and an expansion of built-up areas. Examples include major infrastructure projects, such as the construction of the 45 km Sivok–Rangpo broad-gauge railway line since 2009, which disrupt the ecological balance of Sikkim (Pathak & Shen, 2023).

The most problematic issue is the construction of tourist infrastructure in ecologically sensitive areas such as the *Khangchendzonga Biosphere Reserve*, and along popular trails like the Yuksom-Dzongri-Goechala route (Chettri et al., 2002; Sharma et al., 2016; Chandel et al., 2024). Deforestation in these areas leads to biodiversity loss and the destruction of rare ecosystems, making the area more vulnerable to natural disasters, especially landslides and floods.

Another environmental challenge related to the development of tourism and increasing urbanisation in Sikkim is managing growing amounts of *waste* (Rani et al., 2025). Processing plastic waste in remote mountain areas with limited waste disposal infrastructure poses particular problems. Popular destinations such as Lake Tsomgo, Nathula Pass and the Yuksom-Dzongri trekking route are particularly affected by waste accumulation (Figure 5). Inadequate municipal waste management systems pose serious risks to sensitive mountain ecosystems and the health of local residents and tourists during the current phase of tourism development (Rani et al., 2025; Figure 3). However, given predictions of further tourism growth, inadequate waste management systems can be identified as one of the critical factors in the area's development (Rani et al., 2025). This not only reduces the destination's aesthetic value, but may ultimately lead to irreversible damage to the natural environment and the health of residents and tourists (Gachuiwo et al., 2025; Zimik et al., 2025).

Reports from *NITI Aayog's Composite Water Management Index* (Gaur & Kotru, 2018) also indicate that Himalayan states including Sikkim are becoming increasingly vulnerable to seasonal water shortages. In the coming decades, increased tourist demand will stress already limited *water sources*, especially during the dry season. Glacial retreat from climate change will compound this. Over-extraction of groundwater and diversion of streams for tourist needs reduce water availability for locals and impact downstream ecosystems. Glacial retreat, accelerated by climate change, further compounds the issue. The *Water Resources Department of Sikkim* has noted increased water stress during the tourist season, especially from March to June. Demand for water often exceeds local supplies, particularly during the peak season (mainly from March to June). This subsequently leads to conflicts over access to water. Population growth and development in the area, including industrial and tourism growth, together with specific natural conditions such as characteristic seasonal variability in precipitation and a strong dependence on surface runoff and glacial sources (which are unstable in mountainous terrain and vulnerable to climate change), increase pressure on existing drinking water resources (Shaw et al., 2010; Tambe et al., 2012; Tiwari, 2012; Wester et al., 2019). For instance, in regions like Lachung and Pelling, water sources often dry up during the dry season due to overuse, necessitating the import of water by tanker truck (Chandel et al., 2024).

Other environmental challenges posed by the development of tourism in the area include inappropriate tourist behaviour, such as hiking outside marked trails, making excessive noise, causing vehicle traffic and interfering with and physically disturbing protected areas. This threatens sensitive mountain ecosystems (Belsoy et al., 2012). Sikkim is a biodiversity hotspot with more than 4,500 species of flowering plants, 500 species of birds, and 150 species of mammals, many of which are endemic or endangered (Tambe & Arrawatia, 2012). Endangered species like the Red Panda and Himalayan Musk Deer face habitat fragmentation due to increasing tourist movement in protected zones (Dorji et al., 2012; Acharya et al., 2011). Unregulated tourism leads to habitat fragmentation, poaching and disturbances in wildlife corridors (WWF-India report, 2016). Noise pollution, off-trail trekking, and tourist encroachment into core forest areas disturb wildlife behavior and breeding patterns (Marzano & Dandy, 2012). A *WWF-India report* (2016) on the Eastern Himalayas highlights how tourism without adequate regulation disrupts sensitive ecosystems and contributes to the decline of species such as the Red Panda (*Ailurus fulgens*), Sikkim's state animal. Wildlife habitats may be disturbed by expanded roads, resorts, and unregulated trekking, endangering species such as red pandas *Ailurus fulgens* and Himalayan monals *Lophophorus impejanus* (Thapa et al., 2020). Furthermore, a significant hurdle to biodiversity in Sikkim is bio-piracy. In the past, there have been reports of individuals smuggling seeds and other wild products in the guise of tourists, resulting in violations of the National Biodiversity Act, 2002 (Pradhan, 2023; Pradhan & Sharma, 2024).

Sikkim is vulnerable to the impact of tourism from natural disasters. During the previous twenty years, a couple of moderate (Mw 5.3) and strong (Mw 6.9) seismic events have taken place in the Sikkim area on 14 February 2006 and 18 September 2011, correspondingly. Co-seismic landslides were also generated within 100 km of the epicentre of the 2011 Sikkim earthquake (Mw 6.9) (Joshi et al., 2022). Vulnerability to the impacts of climate change, including changing weather patterns, increased frequency of extreme weather events and melting glaciers, is a key issue for Sikkim (Rahman et al., 2012; Tambe & Arrawatia, 2012; Bawa & Ingty, 2012; Sharma et al., 2024). The livelihoods of local communities and the sustainability of the region's ecosystems are threatened by these effects (Sharma & Rai, 2012; Sharma et al., 2016). Climate change leads to more intense and erratic rainfall in the Eastern Himalayas, triggering frequent forest fires, landslides, floods, and water scarcity while degrading ecosystems and biodiversity (Sharma et al., 2016). Sikkim has experienced significant impacts from climate change, including extreme weather events such as floods and landslides (1968), recurrent landslides triggered by monsoon conditions and erratic rainfall patterns (2000–2003, 2011, 2015, 2016), and a small snow avalanche at 14th Mile on the way to Nathula Pass near the Indo-China border on 4 April 2023, which resulted in seven deaths and 13 injuries (Joshi et al., 2024). A GLOF triggered by heavy rain caused a flash flood from

South Lhonak Lake (October 3–5, 2023). These climate-induced erratic and intense rainfall in Sikkim is repeatedly triggering landslides, infrastructure damage and collapse, flash floods, and GLOFs (Figure 5), disrupting tourism and posing severe safety risks for visitors and reduce the natural beauty and wildlife attractions that draw tourists to the region (Saha et al., 2024; Sattar et al., 2025; Sharma, 2025). Together, they pose a serious threat to the sustainability of Sikkim’s tourism industry.



Figure 5. Sites of tourist interest and critical points for tourism development in Sikkim (Source: Santosh Sharma and Yograj Sharma, private archive) 1: Deforestation and Fuel wood extraction; 2: Rise in Solid Waste due to tourist influx; 3: Red Panda (*Ailurus fulgens*), Sikkim’s state animal; 4: Damage to infrastructure caused by Earthquake, 2011, North Sikkim; 5: Triggering of landslide disaster after 2011 Earthquake, North Sikkim; 6: GLOF Disaster, Singtam, East Sikkim; 7: Economic development in the Sikkim Himalaya is being pursued aggressively; 8: Excavation for broadening of Road near Gangtok, East Sikkim; 9: Homestay in Rural Habitat, East Sikkim; 10: Changu Lake, East Sikkim; 11: Tourists visiting Baba Harbhajan Mandir, East Sikkim; 12: Gurudongmar Lake, North Sikkim; 13: Yumthang Valley, North Sikkim; 14: Parking of vehicles after dropping tourists, Nathula, East Sikkim; 15: Tourists visiting Nathula, East Sikkim

**b) Socio-cultural and economic challenges:** Despite the positive contributions of tourism to Sikkim's economy, its overdependence poses significant vulnerabilities (Laginová et al., 2024). A tourism-centric economy is highly susceptible to external shocks such as pandemics, geopolitical instability, and natural disasters, which can abruptly halt tourist inflows and destabilize local livelihoods (Ibanescu et al., 2020; Matlovičová et al., 2022; Stupariu et al., 2022; Matlovič & Matlovičová, 2024). This reliance often sidelines other vital economic sectors, undermining long-term resilience. Given that tourism in Sikkim is seasonal in nature (Rizal & Asokan, 2014), employment patterns are unstable, resulting in income insecurity and compelling locals to seek alternative livelihoods - contributing to socio-economic disruption and weakening community structures (Matlovičová et al., 2022). Additionally, tourism-driven inflation in land, rent, and goods disproportionately affects local residents in tourist hubs, widening the economic gap between urban and rural areas (Balliu & Zbucea, 2024; Hegedűs et al., 2023; Tóth, 2023). Rapid, profit-driven hotel and transport development leads to urban sprawl and strains local infrastructure (Mishra et al., 2021). While tourism is promoted as a sustainable development pathway, without balanced planning and diversification, it can deepen inequality and undermine the communities it intends to support (Stupariu et al., 2022). Socio-culturally, the rapid expansion of tourism has led to increased population pressure in urban centers like Gangtok, causing congestion, housing shortages, and declining public services (Chandran, 2008; Hegedűs et al., 2023; Tóth, 2023).

Migration from other Indian states to meet tourism-related labor demands has altered Sikkim's demographic composition, causing competition for resources, cultural friction, and marginalization of native communities (Baum, 2010; Bruun et al., 2023). Tourism-driven inequality often benefits only a few stakeholders in major tourist hubs, leaving rural and marginalized populations behind (Zhang, 2022; Subramaniam et al., 2022; Šergo et al., 2024). Furthermore, the spread of communicable diseases through mass tourism, as seen during global health crises, poses public health risks (Findlater & Bogoch, 2018; Fechner et al., 2022; Sacramento, 2023). Culturally, tourism leads to the commercialization of traditional practices, diluting authenticity as festivals, rituals, attire, and languages are repackaged for tourist appeal (Alamineh et al., 2023). Sacred sites like Rumtek Monastery and Gurudongmar Lake face degradation due to overcrowding and disrespectful behavior, undermining their sanctity (Ezenagu et al., 2022). Exposure to global consumer culture and tourism-driven modernization has triggered identity crises among younger generations, who may undervalue their indigenous heritage (Ruhanen & Whitford, 2019). As communities alter traditional lifestyles to meet tourism demands, socio-cultural disruption and weakened cohesion emerge (Gachuiwo et al., 2025). These intertwined challenges call for culturally sensitive, community-led tourism models that prioritize heritage preservation, inclusive development, and long-term sustainability. Measures like tourist caps in high-altitude regions aim to mitigate ecological and socio-cultural pressures (Sikkim Tourism Policy, 2018).

**c) Regulatory Challenges:** The expansion of tourism in Sikkim has outpaced the evolution of regulatory frameworks, presenting serious governance challenges that undermine sustainable development goals. Existing tourism policies often lag behind the scale and speed of tourism growth, leading to inadequate oversight of environmental, cultural, and socio-economic impacts (Pandiya, 2024). Even where eco-tourism and heritage conservation laws exist, weak institutional enforcement renders them largely ineffective, allowing unchecked development in ecologically sensitive zones and near cultural landmarks (Coria & Calfucura, 2012). Land use conflicts have also intensified, particularly where community-owned lands or forest areas are converted for commercial tourism infrastructure, raising concerns over displacement, ecological degradation, and loss of community control (Pradhan, 2021). Moreover, regulatory gaps in permitting and monitoring—such as inconsistencies in tourist permits, trekking route management, and homestay licensing—can lead to overexploitation, illegal operations and corruption (Pradhan, 2021). Compounding these issues is a general lack of awareness among stakeholders about sustainable tourism practices, which limits community participation and weakens compliance efforts (Dam, 2013). These regulatory shortcomings highlight the urgent need for comprehensive, transparent, and locally inclusive policy reforms to ensure tourism in Sikkim remains both economically beneficial and environmentally responsible.

**d) Food Security Challenges:** in Sikkim the land available for agriculture is only 11% and more than 60% of the total population depends on for their livelihood (Agricultural Census, 2011 in Kumar & Rai, 2021). Mishra et al. (2021) found that food availability in Sikkim is insufficient for the current population, highlighting the need to address food production. There has been a notable shift in the cultivation area and production of principal crops in Sikkim over the period 2003 – 2020 (Table 7). Rice, the dominant staple crop, recorded an average cultivated area of 11.84 thousand hectares and an average production of 20.17 thousand tonnes, with compound annual growth rates (CAGR) of 0.91% and 0.93%, respectively, indicating a constant reduction in both aspects (GFAR, 2003-2020). Though wheat occupied a comparatively smaller share of land under cultivation, it demonstrated a positive production CAGR of 1.50%, suggesting potential improvements in yield efficiency in the state (GFAR, 2003-2020). Maize, being the largest share of cultivated land, showed a uniform decline in both area and output (CAGR 0.95%), indicative of a gradual reorientation in cropping patterns. Millet, barley, pulses, and buckwheat displayed modest mean values with predominantly negative growth rates, pointing to a diminishing role in the agricultural portfolio of Sikkim, possibly due to agro-climatic constraints, sustainability challenges, and changes in land use patterns.

Oilseeds, with an average cultivation area of 8.19 thousand hectares, also experienced a consistent decline in both cultivated area and production (GFAR, 2003-2020). Overall, these trends underscore a structural transformation in the state of Sikkim's agrarian economy, marked by the stagnation or decline of traditional cereal crops and limited adoption of alternative crops (Karlin, 2025; Laginová et al., 2024). Climate variability, characterised by unpredictable rainfall, shifting monsoon patterns, and more frequent extreme weather events, has disrupted traditional cropping cycles. Furthermore, the expansion of tourism and its infrastructure, and related commercial activities has accelerated land-use change, diverting fertile agricultural land toward hotels, homestays, and service facilities, thereby reducing cultivation potential.

Table 7. Area (in 000 Hectares) under cultivation and Production (000 tones) of Agricultural Crops in Sikkim (2003-2020) (Source: GFAR, 2003-2020)

Variables		Mean	SD	Max	Min	CAGR
Rice	Area	11.84	2.07	14.74	8.69	-0.91
	Production	20.17	2.09	22.85	16.14	-0.93
Wheat	Area	2.49	2.48	6.38	0.15	0.99
	Production	3.15	3.57	10.36	0.18	1.5
Maize	Area	38.8	1.24	40.85	36.7	-0.95
	Production	65.58	3.6	68.82	57.05	-0.95
Millet	Area	3.24	0.76	4.25	2.05	-0.89
	Production	3.13	0.6	4.18	2.13	-0.91
Barley	Area	0.72	0.31	1.23	0.35	-0.8
	Production	0.78	0.41	1.59	0.4	-0.79
Pulses	Area	6.03	0.61	6.8	5	-0.93
	Production	5.7	0.55	6.76	4.81	-0.93
Buckwheat	Area	3.38	1.15	5.54	2.01	-0.96
	Production	3.16	1.17	5.35	1.55	-0.97
Oil Seeds	Area	8.19	1.5	10	6.06	-0.91
	Production	6.99	0.9	8.2	5.61	-0.93

### The outlook for future growth in Sikkim's tourism sector

Sustainable tourism is a long-term way of not only ensuring the survival of the trade but also positively developing the tourist base, i.e. the wealth of cultural and natural riches (Kamra, 2005). Mieczkowski (1995) rightly pleads, “to blame any economic activity, such as tourism in general, for decreasing environmental quality is like blaming literacy for bad writing.” A congruent and compelling assertion is proffered by Gunn (1994), who contends that whilst a certain degree of soil erosion and the contamination of resources is occasioned by an augmented number of visitors, the preponderance of environmental degradation is attributable to a paucity of strategies, policies and measures to prepare for economic growth. Accordingly, to Gunn (1994), any number of visitors can be accommodated provided the area and the region accepted greater responsibility to plan for and manage all economic growth including tourism. The ‘Carrying Capacity’ concept focuses on ensuring sustainable development at places of touristic interest (Joshi & Dhyani, 2009).

The success of a destination as a tourist hotspot is determined by various factors. These include its carrying capacity, the resilience of its environment, the intensity of activities it offers, and the sociological attributes of the society that welcomes visitors (Joshi & Dhyani, 2009). *Carrying capacity assessment* (CCA) is crucial for sustainable tourism development, particularly in mountain destinations. It helps prevent saturation, optimize resource use, and mitigate negative impacts on natural, social, and economic environments (Jurincic, 1970; Pasko, 2016). CCA is an essential tool for formulating policies and strategies in the tourism industry, allowing for variations in development intensity while maintaining long-term sustainability (Jurincic, 1970; Tselentis et al., 2006). In western Himalayas, studies have examined the carrying capacity of popular destinations like the Gangotri circuit, highlighting the need for sustainable development to enhance economic activities while preserving natural and cultural resources (Sati, 2018). Physical carrying capacity assessments have been conducted in Kinnaur, western Himalayan state Himachal Pradesh to establish tourism standards and prevent tragedies at pilgrimage sites (Jangra & Kaushik, 2020). These studies emphasize the importance of balancing resource utilization, tourism development, and conservation efforts to ensure the long-term sustainability of the Himalayan region.

In Sikkim the carrying capacity have been carried out in few tourism destination sites only for eg. Dzongri, West Sikkim (Bhutia & Guite, 2025). One more study has raised sustainability issue of Yuksom, West Sikkim (Rubita, 2012). Yuksom (1,780 m) is the base village and official starting point of the Goechala trek while Dzongri (about 4,020 m) is a major rest and acclimatization point on the way to Goechala. CCA can address various constraints, including infrastructure limitations, environmental concerns, and community satisfaction (Sharma & Bisht, 2019). By applying CCA principles, destinations can highlight the importance of sustainable management practices and develop long-term policies for tourism communities (Tselentis et al., 2006). It should be integrated into planning processes and considered when defining development scenarios for a given area (Pasko, 2016). Butler (1991) reports instances from mountain regions where the proposals to reduce tourist numbers has not been accepted by the local population in response to the loss of income. Banskota & Sharma (1998) conclude that lack of appreciation of values of environmental resources is root cause of the environmental degradation due to tourism. Another management tool often suggested for sustainable tourism is EIA. Consideration of impacts should occur throughout the planning process including the evaluation of alternative (Inskip, 1987). Ultimately, proper CCA implementation can lead to improved visitor satisfaction and maintain a destination's global status (Sharma & Bisht, 2019; Jurincic, 2025).

### CONCLUSION

Examining visitor trends and the factors influencing the development of tourism in Sikkim shows that it has become one of the region's main drivers of development. However, its dynamic growth is also putting increasing pressure on environmental, social and infrastructure systems. Examining visitor numbers from 1994 to 2024 reveals a nearly sevenfold increase, with a compound annual growth rate of around 9.6%. The most significant acceleration in growth occurred in the last decade (2014–2023), despite a temporary decline caused by the pandemic. While the rapid recovery in visitor numbers after 2021 confirms the destination's resilience, it also highlights the risk of uncontrolled expansion exceeding the ecological carrying capacity of the sensitive Himalayan environment.

The Tourism Area Life Cycle (TALC) linear model, when applied empirically, indicates that Sikkim is currently in the development stage. This is characterised by growing visitor numbers, infrastructure expansion (e.g. the opening of Pakyong Airport, new road connections and eco-friendly resorts) and intensive support from public policies. This development is supported by strategic documents such as the Ecotourism Policy (2011) and the Tourism Policy (2018), which establish regulatory frameworks for environmentally sustainable tourism development and the protection of cultural heritage. However, the study also highlights emerging issues related to local overcrowding and the seasonal concentration of visitors at certain attractions (e.g. MG Marg in Gangtok and Lake Tsomgo), putting increasing pressure on public infrastructure and services.

Environmental risks, such as excessive torrential rainfall and subsequent landslides, have been identified as a key limiting factor for future development. These hazards pose an immediate risk to visitor safety, as well as a long-term risk to the accessibility of elevated tourist sites, and could significantly impact tourism development. They must therefore be addressed through specific planning strategies. Improving the region's environmental management is also essential.

This forms part of Sikkim's tourism development policies. The study's results also confirm the importance of community participation and local initiatives as fundamental pillars of sustainable tourism. Developing homestay facilities, community-based accommodation and local products not only diversifies tourism offerings, but also develops local communities in the region. This is particularly important in preserving the socio-cultural integrity and identity of the region amid rapidly growing tourism. In conclusion, it can be said that the development of tourism in Sikkim cannot be interpreted solely as a linear transition through the phases of Butler's model, but rather as a historically conditioned evolutionary trajectory shaped by geopolitical constraints, environmental policies, and strategic government decisions.

Empirical evidence shows that the current development model based on ecotourism and cultural heritage has the potential to contribute to long-term sustainability, but only if it is accompanied by consistent visitor regulation, product diversification, and systematic environmental risk management. The study thus points to the need for an integrated policy framework that reconciles the potential economic benefits of tourism with the protection of natural resources and the quality of life of local communities. The contribution of this study lies in its empirical application of the life cycle model to Sikkim, as well as in emphasising the importance of evolutionary and path-dependent perspectives in helping us to understand the longer-term consequences of tourism development in ecologically sensitive mountain regions.

The results can serve as a relevant basis for policymakers and planners not only in Sikkim but also in other parts of the Indian Himalayas, where a balance between tourism growth and environmental resilience needs to be sought.

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