

# Environmental sustainability and tourism – implications of trend synergies of tourism in Sikkim Himalaya

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*This article analyses tourism in Sikkim, a small Himalayan state of India, in light of the most general kind of tourism process models and tourist influx trends. The tourism trends are studied to map the state of progress and prospects of tourism in the state, and for the general understanding of patterns of tourist influx. Tourism in Sikkim is predominantly domestic; foreign tourists comprise only 5.5% of the total tourist influx. The trends reveal that Sikkim tourism is in the developmental stage of increasing growth of tourist influx. Simulations based on three scenarios suggest that approximately 7.6–10.4 lakhs tourists would visit Sikkim during the year 2017, which would also have implications on the infrastructure, environment, natural resources, culture and eco-tourism of the state. The impacts are also analysed in light of projected increase in the population and trends of livestock resources and agricultural production. A proactive planning involving optimal use of management options, therefore, is required for a viable symbiosis of tourism and environment, and sustainability of tourism in the state.*

**Keywords:** Environmental sustainability, tourist influx, tourism process models, trend synergies.

TOURISM and environment are intricately related. The environment of a tourist destination, its socio-cultural attributes, resources and heritage value constitute the basic background elements for the evolution, growth and development of tourism in that area. Holder<sup>1</sup> sees the environment as a resource of tourism. The increasing tourism activities in a tourist destination often result in overuse and degradation of the environment and resources of tourism which in turn lead to a decline in the growth of tourism, and loss of tourism value of the destination. Tourist destinations usually follow a lifecycle; the boom and bust course is most common. Tourism in a destination depends on the carrying capacity, resilience of the host/destination environment, intensity of tourist activity, and sociological attributes of the host society. Therefore, the longevity and sustenance of tourism needs special considerations regarding the sustenance of the host environment and the socio-cultural fields. The tourist influx trends can be useful in understanding the destinations in terms of the state of progress of tourism, its prospects, future course, impacts and sustainability. This article uses these trends to synergize the tourism situation in Sikkim

to point out its likely implications for the environment, and policy and sustainability of tourism.

## Impacts of tourism

Tourism development in any area invariably leads to economic growth of that area, which is manifested in terms of increase in income and employment opportunities, infrastructural growth, improvement in the standard of living, etc. Its multiplier spin-off effects for the host communities are enormous, and have a wider distribution. But tourism development is often accompanied with a host of negative impacts on ecology, environment, and socio-economy of the host communities/destinations<sup>2-5</sup>. The studies on tourism reveal its negative impacts in terms of loss of biodiversity, deforestation, congested settlements, landscape alterations, slums, pollution of air, water and soil, siltation of water bodies, loss of wetlands, loss of land titles, social alienation, change in lifestyle and traditions, etc.<sup>2,6,7</sup>. The much talked about economic gains are captured by a handful of people, while the social costs are borne by the entire host community. Leakages further reduce the economic gains for the host community. At times tourism also poses a threat to the host culture<sup>8-10</sup>.

Tourism growth, often, even in well-managed eco-tourism sites results in degradation of the base resource or culture, which forms the very basis of tourism in that particular area<sup>11</sup>. Sometimes, the local communities do

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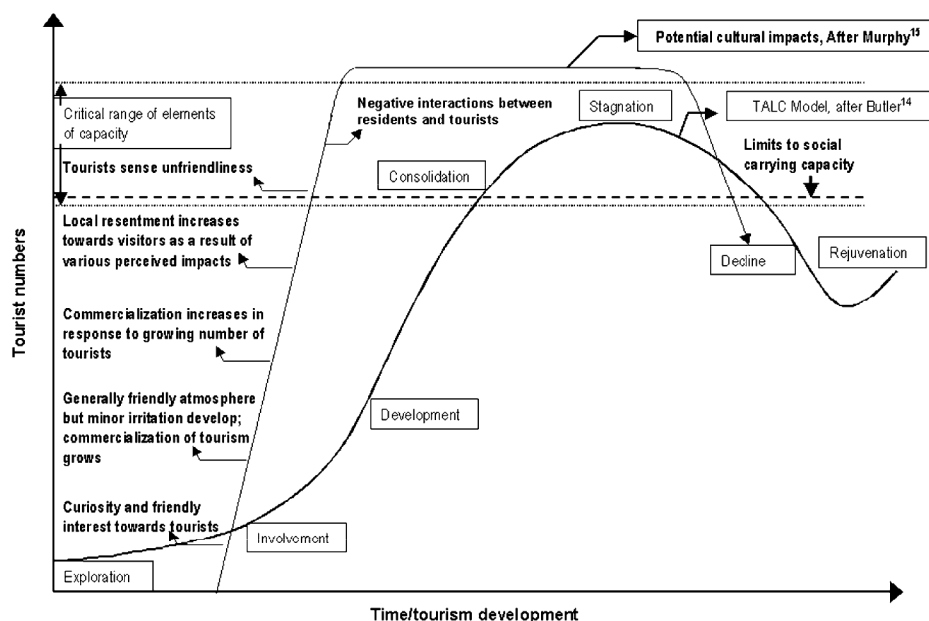


Figure 1. Schematics of tourism development. (Source: Butler<sup>14</sup> and Murphy<sup>15</sup>.)

not get even the slightest of benefits of tourism. Also, the growth of tourism beyond a stage often sparks conflicts between the hosts and the tourists. Increase in tourist influx and subsequent development of tourist-related infrastructure also put pressure on the carrying capacity of the destination areas. As a result, the tourist interest in the area start waning, ultimately leading to a change in tourist quality, and decreasing number of tourists to the area, which gradually loses its appeal and tourism.

### Schematics of tourism process

The course that a tourist destination takes has been represented in various models of tourism process<sup>12–15</sup>. These models assume that the tourist destinations have a life-span and their journey from evolution to decline follows a lifecycle. They have a boom phase, which is followed by a bust phase<sup>12,13</sup>. The life-span of tourist destinations depends upon the destination characteristics, tourist type, and the host community. The models by Butler<sup>14</sup> and Murphy<sup>15</sup>, which most aptly describe the lifecycle of tourist destinations, are reproduced in Figure 1. The Tourist Area Life Cycle (TALC) model developed by Butler is an amalgam of the product lifecycle model and the model of population growth. This correlates the different stages and the course of evolution of destination areas or tourism development with the stages of product lifecycle and population cycle by linking tourism experience, which is consumed, with product and carrying capacity. Murphy explains the rise and fall of tourist destinations in terms of tourist–host interactions/transactions and social carrying capacity.

The concept of these models is based on the premise that like the trends of animal population or the sales per-

formance of a product in the market, the number of tourists visiting an area initially grows at a gradual pace. Later, because of the hospitality and with the growth and development of infrastructure, the tourist population enters a phase of continuously increasing growth, reaches a point of maximum growth. Thereafter, it follows a declining rate, reaches a stagnation stage as the social, biological and environmental carrying capacities are exceeded, and after a peak the tourist population starts declining due to degradation of resources, over crowding, negative tourist–host interactions, and decline of overall tourism experience. The bust course becomes a norm unless efforts for restoration are made. The cyclic pattern of tourist trends, the inevitability of carrying capacity violations and the decline after the peak are the three basic elements of these models. The models also acknowledge the scope and importance of management for resurrection of tourism from its bust phase, or the expansion of the boom phase before the breach of carrying capacity cut-offs. The sustenance of tourism through revival from bust course or by regulation of tourist numbers within carrying capacity limits, therefore, requires special efforts towards tourism management, and conservation and sustenance of the host environments. The patterns of tourist influx trends therefore can be useful in identification of the state of progress of tourism, its future course, impacts and likely implications for the sustainability of the environment and tourism.

### Tourism scenario in Sikkim

Sikkim, a former British Protectorate, became a part of India, as the 22nd state of the Indian Union on 16 May

1975. It is located in the realms of the snow-clad peaks of the Himalayas, including the world's third highest peak, Mt Khangchendzonga (altitude 8585 m). The geographical expanse of the state covers 27°4'46" to 28°7'48"N and 88°58" to 88°55'25"E, and altitudinal range of 270 to 8585 m. It is located north of the Darjeeling–West Bengal Hills, and shares international borders with Nepal in the west, China in the north and northeast, and Bhutan in the east. The total geographical area is 7096 km<sup>2</sup> and the terrain is dominated by hills and forests with approximately 43% of the geographical area under the protected area network.

The state is a biodiversity hotspot and is inhabited by a mix of ethnic cultural groups with a great diversity of cultural traditions and practices. The congenial climatic conditions, rich biodiversity, panoramic view of mountains and valleys, villages in picturesque settings, pristine lakes and forests, cascading waterfalls, flower blooms and wilderness of trekking trails, Buddhist monasteries and religious artefacts, and cultural festivals of Bhutia and Lepcha tribes constitute the important elements of tourism in the state. Sikkim thus provides a varied experience ranging from urban mass tourism, to village tourism, nature tourism, religious and cultural tourism, and adventure tourism.

Tourism in Sikkim also developed spontaneously with the growth of infrastructure. However, the real efforts for development of tourism like consciousness building, awareness development and initiatives at the government and community level started in the 1990s. The period also saw the development of tourism-related infrastructure and increasing emphasis on eco-tourism. A number of village tourism sites were developed and entrusted to community control. Sikkim, the ultimate eco-tourism destination, became the policy emphasis of the government and a tourism plan was developed. Development and marketing of at least one place in each of the 32 constituencies as an eco-tourism site/destination was envisaged<sup>16</sup>.

Today, a number of tourist-related fairs and festivals are being organized in various tourist destinations to highlight the specific cultural characteristics and to popularize the important attractions of the concerned destination. Some international events like the International Florishow have also been initiated by the government to expose the visitors to the variety of floristic diversity of the state. Cultural festivals of the local ethnic groups and the various Buddhist monasteries also comprise tourist attractions.

Eco-tourism/nature tourism in the state is well supported by the institutional arrangements at village and community levels. Several capacity-building and awareness programmes are being continuously organized by NGOs and the State Tourism Department for the stakeholders to sensitize them on issues related to the environment and for better tourism culture and management in the state.

Today, the number of tourists visiting Sikkim has reached 3.5 lakhs per annum. Tourist-related infrastructure is being expanded in the state, and many new areas are being developed for tourism purposes. An environmental fee is also being charged on visit to some environmentally sensitive zones.

### Tourism trends

The general trend of tourism growth, based on the last 28 years of data, i.e. 1980–2007, is mapped in Figure 2. The figure shows that presently tourism in Sikkim is mainly of the domestic kind; foreign tourists comprise only 5.5% of the annual tourist influx. The pattern obtained for the tourist rush shows small initial fluctuations from 1980 to 1987, a linear trend from 1987 till 2000–01, and thereafter a steep rise in the trends with tourist numbers increasing every year. A segmented description of the trends for comparison is also given in Table 1. Analyses of tourist data suggest an average increase of 4599.10 persons/yr in tourist rush between 1980 and 1990, 9157.20 persons/yr between 1990 and 2000 and 28014.71 persons/yr between 2000 and 2007. The tourist rush exhibits an increase from 15,434 in 1980 to 349,100 in 2007. This growth in tourist numbers and the prevailing tourism opportunities in Sikkim, correspond to the 'Development' stage of the model (Figure 1), which in turn suggests a hospitable and friendly atmosphere for tourist–host interactions, ideal stage for the development of tourism-related infrastructure and increase in growth of annual tourist visits. The trend pattern, its curvature and exponential trajectory (Figure 2) reveal positive prospects for the growth of tourism in Sikkim in the coming years. The excess capacity that exists and is being generated promises good potential for income, employment and investments in the sector. The progress in the last one and half decades spurred development of many new sites/areas. Entrepreneurship in the sector and allied businesses at the village, community and individual capacities have also begun developing.

### Seasonal influx patterns and monthly profile

Though the tourists come to Sikkim all round the year, the main rush is confined to summer months and autumn season; the autumn rush is considered to be more pronounced during the Dussehra festival. The monthly pattern of the 'overall tourist inflow' for 2003–07 is presented in Figure 3. The figure suggests a bimodal annual trend with two distinct peaks during April–May and October–November. The month-wise profiles of statistics for domestic and foreign tourists<sup>17</sup> based on the available data (1987–2007) are given in Table 2. Ranking of months in terms of foreign tourist rush suggests October, April, November and March as periods in descending

order of tourist rush/numbers. July and June comprise the lean months for foreign tourist influx, with minimum rush records for June. The domestic tourist rush is maximum in May, followed by April, October, November and June in descending order. The minimum rush was recorded during the rainy season, i.e. July and August, with July recording the lowest value. The overall pattern, i.e. combined pattern of domestic and foreign tourists, replicates the domestic pattern, as the foreign tourists constitute only a small portion of the domestic rush. Figure 3 also suggests a rise in tourist inflow during March.

April, May, October and November together account for 53.4% of the annual tourist inflow (April and May – 32.5%, October and November – 20.8%). Tourist data for the year 2007 suggest that nearly 1.8 lakh tourists visited Sikkim during these four months.

Season-wise break-up (Table 2) also suggest 40% influx in summer months (April–June) and approximately 28% influx during October–December. If inflow of tourists in March is also accounted in summer season, the influx for the four months, i.e. March–June, sums up to 48%, nearly half of the total annual influx. The remaining months, i.e. January, February and July–September have

an inflow of approximately 5% of the annual inflow of tourists per month.

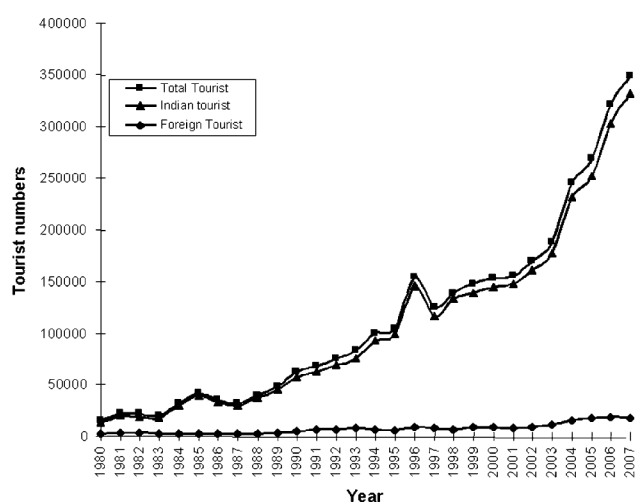
This skewed pattern for tourist inflow promises more jobs and business opportunities only during the summer and autumn months, but not during the lean period. Such situations underline the need for some other alternatives to supplement the income and employment requirements during the lean periods. Also, the seasonality of the high inflow puts more pressure on the resources, local infrastructure, civic amenities, and the culture and environment of the tourist areas of Sikkim Himalaya.

### Profile of human population

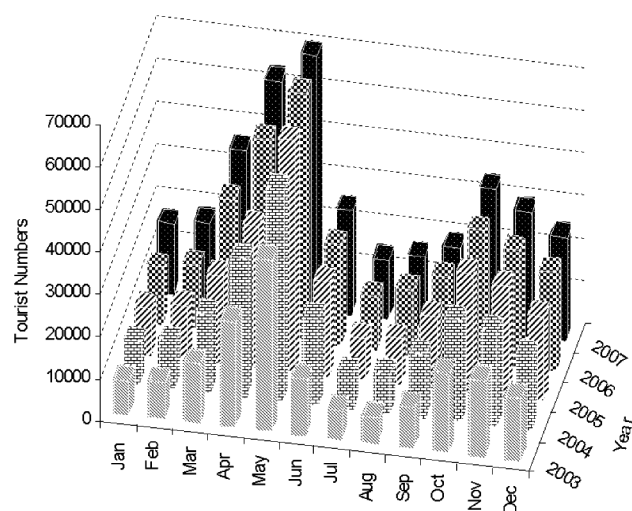
The human population of Sikkim in 1971, before its merger with India, was 209,841. According to the census records, the population for the years 1981, 1991 and 2001 were 316,385, 406,457 and 540,851 respectively<sup>18</sup>. A recent survey puts the population in 2006 at 581,546, comprising of 302,852 males and 278,694 females<sup>19</sup>. The population showed 50.77% growth during 1971–81, 28.47% during 1981–91 and 33.06% during 1991–2001. The state is sparsely populated and had a population density of 76 persons/km<sup>2</sup> in 2001, which according to the State Socio-Economic Survey 2006 report<sup>18,19</sup> has increased to 82 persons/km<sup>2</sup>. Out of the four districts in Sikkim, namely East Sikkim, West Sikkim, North Sikkim and South Sikkim – the East Sikkim has the highest density of 281 persons/km<sup>2</sup> while the North Sikkim which is the largest in terms of geographical area (4226 km<sup>2</sup>, nearly 60% of the total area of Sikkim) harbours the lowest density of only 9 persons/km<sup>2</sup>, as nearly 67% of its area lies in inhospitable domains of perpetual snow and high-altitude alpine zones. The literacy in Sikkim<sup>19</sup> is 80.66%, with rural literacy 79.82% and urban 89.41%.

**Table 1.** Comparative statistics of annual tourist influx (domestic + foreign)

Parameter	Tourist statistics		
	1980–90	1990–2000	2000–07
Mean	33,109.09	109,838.70	231,014.90
SD	13,732.71	35,465.67	76,690
Maximum	61,425	15,3898	349,100
Minimum	15,434	61,425	152,997
Growth/yr	4599.10	9157.20	28,014.71



**Figure 2.** Tourist influx trends in Sikkim: 1980–2007.



**Figure 3.** Monthly profile of tourist influx to Sikkim (2003–07).

**Table 2.** Statistics of tourist influx (monthly profile: 1987–2007)

Month	Domestic tourists			Foreign tourists			Overall tourists			Percentage of annual traffic
	Mean (SD)	Maximum (minimum)	Rank of tourist rush	Mean (SD)	Maximum (minimum)	Rank of tourist rush	Mean (SD)	Maximum (minimum)	Rank of tourist rush	
January	5874.286 (3894.24)	15,967 (1883)	X	397.381 (256.91)	866 (14)	IX	6271.667 (4111.42)	16,833 (1916)	X	4.36
February	6228.905 (4117.39)	16,791 (1971)	IX	584.0952 (359.36)	1286 (108)	VII	6813 (4433.86)	18,077 (2188)	IX	4.74
March	10,383.14 (8552.20)	33,987 (2054)	VI	1015.952 (648.13)	2280 (118)	IV	11,399.1 (9114.25)	36,212 (2172)	VI	7.92
April	17,163.57 (13181.53)	51,231 (2254)	II	1297.762 (741.12)	3124 (142)	II	18,461.33 (13872.75)	53,617 (2550)	II	12.83
May	27,568.57 (17679.74)	59,621 (3492)	I	671.5238 (364.20)	1445 (102)	V	28,240.1 (17994.47)	60,679 (3604)	I	19.63
June	11,868.05 (6741.55)	24,325 (2144)	V	296.8095 (188.74)	631 (14)	XI	12,164.86 (6899.80)	24,956 (2181)	V	8.46
July	5442.952 (3272.43)	13,921 (2175)	XII	233.619 (127.36)	549 (31)	XII	5676.571 (3382.96)	14,470 (2239)	XII	3.95
August	5560.571 (3820.26)	15,311 (1612)	XI	353.5714 (188.43)	811 (82)	X	5914.143 (3985.34)	16,122 (1694)	XI	4.11
September	7772.286 (4859.73)	18,098 (3072)	VIII	534.4762 (339.60)	1346 (75)	VIII	8306.762 (5172.42)	19,328 (3190)	VIII	5.77
October	15,500.48 (7029.53)	30,956 (2982)	III	1421.286 (821.39)	3106 (415)	I	16,921.76 (7779.34)	34,062 (3397)	III	11.76
November	11,925.48 (7694.85)	27,314 (2291)	IV	1076.429 (663.69)	2471 (185)	III	13,001.9 (8313.49)	29,785 (2601)	IV	9.04
December	10,053.52 (6496.87)	23,741 (3235)	VII	633.6667 (350.85)	1225 (19)	VI	10,687.19 (6768.08)	24,959 (3542)	VII	7.43

Source: Department of Tourism, Govt of Sikkim; Rai and Rai<sup>17</sup>.

### Livestock population and agricultural production

Tables 3 and 4 show comparative data of livestock populations and agricultural production of Sikkim respectively<sup>19–21</sup>. Percentage increase/decrease in livestock numbers for the period 1977–2006 for the average overall change, and for the period 1997–2006 calculated/projected for 10 years have also been shown for comparison. Except for poultry, nearly all the livestock populations show a declining trend, with buffalo population showing maximum rate of decrease (29.4% per 10 years) followed by sheep (29.1% per 10 years). The changes aggregated for 10 years for the period 1997–2006, show decline at a faster rate, i.e. buffalo – 65.9%, sheep – 55.7%, yak – 23.3%, cattle – 23.2%, goat – 21.8% and pig – 20.3%. Though these trends suggest decreasing animal pressure on the environment and natural resources of the state, they hint towards decreasing production and supply of indigenously produced livestock products. This also reveals the evolving disharmony in appropriate livestock–

agricultural land ratio, crucial for the agricultural sustainability of the hill areas.

Approximately 91.55% of the population of Sikkim lives in rural areas and nearly 15% of the total geographical area is under agriculture. Statistics of agricultural production of important crops in Sikkim and their area under cultivation (Table 4), shows decreasing trends in cropped area/cultivation area of all the cereals crops, pulses and oil seeds, except maize. A cursory review of data from 1995–96 to 2006–07 suggests a stability achieved or a marginal decrease in the production of these crops. Wheat, however, shows a significant decrease in production and maize an increase both in terms of cropped area and production.

The data for overall change per 10 years for the period 1985–86 to 2006–07, and recent trends reflect a deficit of most of the foodgrains. Amongst the cash crops and other fruits, barring large cardamom, almost all the crops reveal considerable increase in terms of cropped area as well as production. The statistics of change in production for cash crops (for the period 1985–86 to 2006–07)

**Table 3.** Livestock statistics in Sikkim

Livestock	Population (year-wise)			Change in population/10 yr based on periods	
	1977	1997	2006	1977–2006	1997–2006
Cattle	157,546	143,024	109,839	–10.44%	–23.20%
Buffalo	5438	1970	801	–29.40%	–65.93%
Sheep	16,104	5023	2503	–29.12%	–55.74%
Pig	18,595	26,975	22,053	+6.61%	–20.27%
Goat	88,986	82,980	66,699	–8.64%	–21.80%
Yak	3995	4781	3341	–5.64%	–33.46%
Poultry	220,927	219,552	270,800	+7.78%	+23.36%
Horse	–	–	1225	–	–
Rabbit	–	–	819	–	–

Source: Refs 19 and 20.

**Table 4.** Comparative statistics of crop production

Crop category	Crop	Mean production '000 tonnes/ (mean cropped area '000 ha) during years				Change/10 yr production/(area)	
		1985–86	1995–96	2000–01	2006–07	1985–86 to 2006–07	1995–96 to 2006–07
Food grains	Rice	16.50 (15.90)	21.87 (15.94)	21.35 (15.21)	21.45 (14.15)	+14.28% (–5.24%)	–1.74% (–10.21%)
	Wheat	16.20 (10.10)	15.30 (8.42)	10.10 (7.21)	10.36 (6.38)	–17.17% (–17.54%)	–29.35% (–22.02%)
	Maize	47.60 (38.10)	56.56 (39.94)	59.61 (39.90)	64.89 (40.85)	17.30% (+3.44%)	13.39% (+2.07%)
	Other cereals	7.70 (9.00)	8.06 (8.27)	6.97 (7.69)	6.96 (7.33)	–4.58% (–8.84%)	–12.41% (–10.33%)
	Total pulses	8.45 (9.50)	5.91 (6.73)	5.16 (6.03)	5.45 (5.96)	–16.91% (–17.74%)	–7.07% (–10.40%)
Cash crops	Mandarin orange	5.00 (4.60)	7.00 (6.60)	7.50 (6.65)	9.25 (5.55)	+40.48% (+9.83%)	+29.22% (–14.46%)
	Off-season vegetables	–	7.60 (1.70)	9.55 (2.02)	14.29 (3.01)	–	+80.02% (+70.05%)
	Potato	16.40 (5.00)	24.00 (5.50)	25.50 (6.20)	29.98 (6.96)	+39.43% (+18.67%)	+22.65% (+24.13%)
	Ginger	10.90 (2.30)	24.00 (4.50)	24.00 (5.10)	35.98 (6.70)	+109.57% (+91.08%)	+45.38% (+44.44%)
	Large cardamom	3.90 (20.90)	3.60 (23.55)	4.67 (23.48)	2.47 (12.50)	–14.16% (+19.14%)	–21.71% (–42.65%)
Other crops	Oil seeds	10.25 (10.75)	7.64 (9.73)	7.38 (9.99)	7.29 (8.97)	–13.75% (–7.88%)	–4.16% (–7.10%)
	Other fruits	17.80 (8.45)	23.30 (7.40)	27.75 (8.65)	37.51 (9.56)	+52.73% (+6.26%)	+55.44% (–26.53%)

Source: Refs 20 and 21.

indicates overall increase per 10 years for ginger – 109.57%, mandarin orange – 40.48%, potato – 39.43% and other fruits – 52.73%. Such trends for the last 10 years, i.e. 1995–96 to 2006–07, show increase in production from 22.65% to 55.44%, and 80.02% for off-season vegetables. The decrease in foodgrain production and increase in cash crops, represent a situation typical to monetization of village economy. In remote villages like

Lachen and Lachung people are using their agricultural land to construct resorts for the development of tourism.

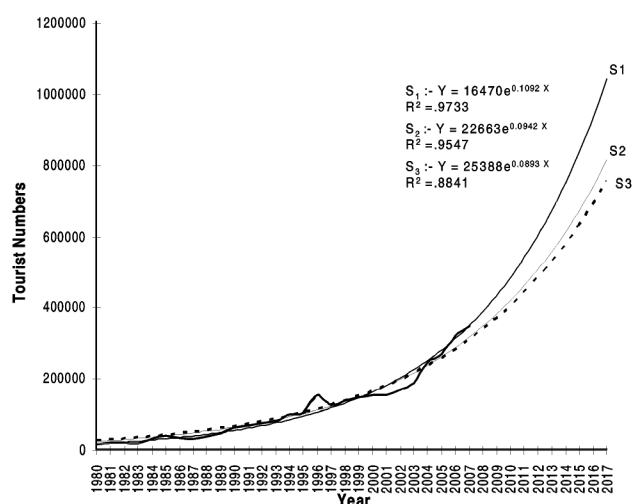
### Trend synergies and implications

The tourist inflow trends suggest that tourism in Sikkim is on the rise. With increasing per capita income and more disposable income, improved infrastructural facili-

ties, better mobility, increasing desire amongst the urban people to explore and experience new areas, etc. the tourism in Sikkim is destined to grow further in future.

Figure 4 represents three scenarios depicting projections for the overall tourist inflow to Sikkim in the next 10 years, i.e. up to 2017. The scenarios S1, S2 and S3 have been derived from the tourist influx data for the years 1980–2007, 1990–2007 and 1995–2007 respectively, and trends drawn for the period 1980–2017. Predictions based on the trends suggest 7.6–10.4 lakh tourist visits to Sikkim by 2017. The trend pattern in 2000–07, the stage of tourism development according to the model (Figure 1), and policy emphasis of the state suggest a congenial and hospitable atmosphere for tourism growth, hence a higher turnout of tourists cannot be ruled out. The excess capacity and unused potential of tourism in terms of splendid scenic views, pristine forest and lakes, tribal cultural and cultural diversity, etc. also corroborate the scope for further growth. However, overall tourist influx for 2001–07 suggests a linear growth of approximately 34,519 tourists/yr ( $Y$  (tourist numbers) =  $34519.25X$  (year-2000) + 104083.3;  $R^2 = 0.9752$ ,  $t_{\text{coefficient}} = 14.02$ ,  $P = 0.00003$ ), yielding an estimate of seven lakhs tourist influx in 2017. If market considerations and impact of demand and supply changes are taken into account, a lower projection seems more plausible; however, the trends of increasing annual influx growth point towards an estimate above seven lakhs. The scenario S3, which more closely matches the above estimation, therefore, can be taken as the lowest value of approximation of tourist influx.

Tourism in Sikkim Himalayas is showing its impact on forests in terms of extraction pressures for firewood, fodder and timber, changes in species composition, and poor regeneration status of firewood along the trekking corridors of Yuksam–Dzongri area<sup>22–24</sup>. Rai and Sundri-



**Figure 4.** Projection of tourist inflow trends (where time ( $x$ ) = 1, 2, 3, ..., which corresponds to years 1980, 1981, 1982, ...).

yal<sup>24</sup> have studied impacts of tourism in terms of pressure on resources and degradation of forests and lands, deterioration of pastures and changes in pastoralist traditions, problem of litter and garbage and waste degradation at the level of 1 lakh annual tourist influx. They have also raised apprehensions that tourism growth could also lead to habitat destruction, resource depletion and changes in subsistence agricultural economy of the state. The trends of livestock population and agricultural production in Tables 3 and 4 also support this notion. The decreasing trends of livestock population and food crops, and increase in the area and production of cash crops can be seen as a consequence of monetization of village economy which can be attributed to tourism. In some of the rural areas, diversion of agricultural land for tourism purposes is common.

The tourist incursion at such large numbers ( $\geq 7.6$  lakh), besides its concomitant economic gains, would have serious repercussions for the much popularized eco-tourism mode of development that is being propagated in the state. The rich biodiversity, natural resources, pristine environment, cultural heritage, etc. would be exposed to the threat of mass consumption (movement) and impacts of outside culture. Scenario S3 implies approximately 63,000 tourist visits per month during 2007; inflow of 2.46 lakhs for April and May (April – 97,000, May – 149,000), and 1.59 lakhs for October and November (October – 90,000 and November – 69,000). Assuming the average period of stay of a tourist in Sikkim as 7 days, the average floating population of tourists approximates to 16,000 per month. The month-wise estimates are as follows: a floating population of 37,000 for May, 24,000 for April, 22,000 for October and 17,000 for November. Though this comprises a small portion of the current population of the state, which is 581,546 according to the 2006 census<sup>19</sup>, and would be distributed over the few tourist pockets, its implications for eco-tourism cannot be ruled out. Urban centres like Gangtok, the capital of Sikkim, which is visited by 90% of the tourists coming to Sikkim and acts as a base point for visits to eco-tourism sites/destinations, would experience enormous pressures on infrastructure, and resources. Expansion of urban areas, traffic problems, problems of solid waste, shortage of drinking water, degradation of forests, biodiversity loss, acculturation, cultural drift, changes in demographic composition, and increase in cost of living would be some of the social and environmental costs to the state.

Linear projection on population statistics –  $Y$  (population) =  $99440.44 + 10733.34X$  (year-1961),  $R^2 = 0.9959$ ,  $t_{\text{coefficient}} = 26.92$ ,  $P = 0.0001$ ;  $t_{\text{intercept}} = 7.89$ ,  $P = 0.0042$  – yields an estimate of about 7.0 lakhs for the year 2017. This shows an increase of nearly 20.36% of the population during 2006, suggesting an overall proportionate increase in the pressure on the environment, natural systems, demand–supply and infrastructure facilities of the

state. The densely populated urban tourist areas will experience maximum pressure. Cluttered settlements, crowding, traffic congestion, expansion of urban areas, increase in cost of living, etc. would be more pronounced and may lead to a decrease in quality tourist influx. This effect combined with 7.6 lakh tourists with an average stay of 7 days, would amount to a pressure equivalent to:  $1.20 \times$  pressure of inhabitant population +  $2.5 \times$  pressure of tourist population, at year 2006 levels (where  $2.5 = 7.6/3.02$ , 3.02 lakhs = tourist inflow for 2006). Assuming equivalence in the impact and demand of a tourist with that of an inhabitant, the combined overall impact would sum up to 123.08% or 1.23 times the pressure exerted by the human population at 2006 levels. Further, segregation for the tourist seasons suggests an average of 124.46% of pressure for summer months (126.41% for May, 124.19% for April and 123.13% for June), and 123.21% for October–December (October – 124.21%, November – 123.32%, December – 122.79%).

As population and tourist inflow are not evenly distributed, the combined impact would be maximum for high population density and high preference tourist areas. Though it suggests only 25% increase from the current level of the population, select tourist areas, i.e. areas which are thickly populated, and the ones visited by most of the tourists will experience maximum pressure. Speculating on the population data, which show 7% growth from 2001 to 2006, suggests that by 2017 the population of Gangtok town (which was 29,354 in 2001)<sup>21</sup> would reach 37,804 ( $29,354 \times 1.07 \times 1.2036$ ). As this place is visited by 90% of the tourists visiting Sikkim, and if we assume that half of each tourist's time is spent at Gangtok, then the town would have a minimum floating population of 3377 tourists in July to a maximum of 16,763 tourists in May. So, the minimum net pressure on Gangtok town would vary from a population of 41,181 to 54,567, which is 1.40 to 1.86 times that exerted by the town's resident population for the year 2006. Again, assuming that 80% of the tourists visiting Gangtok also visit the adjoining alpine nature tourist areas like Tsomgo (chhangu) lake, such areas may receive a tourist inflow ranging from 720 tourists/day in June to a maximum of 3576 tourists/day in May.

Growth of tourism would have its own demands on food. Food requirements of the tourists are met with from local produce and the markets. Provisioning of these requirements for a large floating population of tourists exerts pressure on the natural resources and production systems of the host destinations. Further, such demands are also required to be met with for the increase in host populations. Sustainability of tourism which is linked with environmental sustainability demands that the existing levels of production are maintained and improved, so that the market opportunities created and accruing benefits are not lost to the hosts. Though the declining trends for most of the livestock populations (Table 3) suggest

decreasing livestock pressure on the environment and natural systems, they also indicate reduced supply of indigenously produced livestock products. Assuming that these trends of livestock population continue, then for maintaining proportionate supplies of the existing levels for 2017, the supply deficits in terms of overall change/10 years as evident for the period 1977–2006, or as per current trends/10 years as given for the period 1997–2006 (Table 3) would need to be managed. In addition, supplies for tourists and increase in population (20.36% for inhabitant population, 1.29%–6.41% for monthly demands of tourists, and 3.08% towards overall tourist demands) also required to be maintained. This share of demands from the indigenous production and market supplies would be substituted by external sources and imports from other provinces/states. This would lead to drain of local/state money, including a share of the tourism money, outside the state. Further, in popular tourist pockets demand and supply requirements would be more and any shortfalls in supplies would lead to rise in prices of related commodities.

Similarly, the change in demands for foodgrains, i.e. the deficit from existing levels plus demands of increased population and tourists, from the indigenous production and local markets, and seasonal variations therein, would also be substituted from external sources, again lead to leakage and price rise in food products. In the case of Gangtok, for example, such requirements in 2017 would swell to 143–186% per month of the town's populations in 2006 levels. This would lead to a considerable increase in the cost of living and increase in the prices of related commodities and perishable items like fruits and vegetables. The spurt in the production of cash crops and other fruits, however, could match the demands of time; yet declining livestock population, agricultural production and gradual switch towards cash crops are indicative of changing agricultural traditions and monetization of village economy attributable to tourism. The abandoning of traditional agriculture and diversion of agricultural land for infrastructure and resort development for tourism in some remote villages also testifies to this. The study also suggests that overall pressure on natural resources, environment, production and supplies would be maximum in high population density and high-preference urban tourist areas, followed by the adjoining high-preference nature tourist areas, low-density moderate to low-preference tourist areas, and moderate to low preference nature tourist areas.

The impacts of tourism would be more, if we assume at higher weightage for the demands of tourists. Similarly, if we consider the immigration of population as labour force for construction and service sectors of tourism, and tourist incursion at a higher value of 10.4 lakhs according to scenario S1 (Figure 4), the impacts would enlarge further, which in the long run may affect sustainability of tourism. Though the opening of new sites for tourism and the environmental fee system that the State Government



has introduced, would diffuse pressure in some select pockets, a comprehensive appraisal of tourism for impacts and management options is necessary for conservation of base resources and maintaining the continuity of the benefits streams for the society. Sikkim's sustenance in the prevailing mode of tourism, which is a combination of popular tourism and eco-tourism, or its transition to ecotourism, as the policy motto of the state reads, at the current patterns of tourist inflow, growth of population, and emerging resource use priorities would be a tough challenge in the coming times.

## Conclusion

The natural environment of Sikkim and its rich cultural diversity provide congenial conditions for the growth of tourism. The potential of tourism for the economy is well recognized in the state. Analyses of tourist influx suggest favourable trends and progressive state of growth for the development of tourism. The projections of trends for the next 10 years suggest a sizable increase in tourist numbers. Though such an increase would create numerous job and income opportunities in the state, implications of the large turnout of tourists on the state's resources, infrastructure, cultural environment and eco-tourism would be significant. Accounting for the increase in population reveals that high-density, high-preference urban tourist areas such as Gangtok would receive the brunt of such impacts. The impacts of tourism in terms of monetization of rural pockets/economy are also showing in terms of changing agricultural traditions reflected in declining trends of livestock population, production of foodgrains, and apparent switch towards cash crops. Apart from the gradual drift from tradition, replenishing foodgrain supplies and livestock products from the outside would result in leakage and increase in the cost of living in the popular tourist pockets. Eco-tourism and its sustainability in the state would face a testing time and suitable management options are, therefore, needed.

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