

Chapter 1



INTRODUCTION

Sikkim is a small mountainous State in the Eastern Himalayan region in India. It covers an area of 7,096 sq. km, extending approximately 114 km from North to South and 64 km from East to West. The State is situated between $88^{\circ} 00' 58''$ and $88^{\circ} 55' 25''$ East longitudes and $27^{\circ} 04'$ and $28^{\circ} 07' 48''$ North latitudes. It is surrounded by vast stretches of Tibetan plateau in North; Chumbi valley & Kingdom of Bhutan in the East; Darjeeling district of West Bengal in South and Kingdom of Nepal in West. With nine sub-divisions & eight towns the State has four districts namely East, West, North and South.



The State being a part of inner ranges of mountains of Himalayas has no open valley and no plains but varied elevations ranging from 300 to 8583m above mean sea level consisting of lower hills, middle and higher hills, alpine zones and snow bound land. The highest elevation of 8583 meters being the top of the mountain Khangchendzonga itself.



The Himalayas is our country's pride and is a symbol of value systems. They are in almost every way superlative. They are the highest mountain range on Earth with just about all of the highest mountains in them. They form one of the greatest physical and cultural barriers and they are stupendously beautiful, still relatively unspoilt and full of fascinating human and natural life. In many cases, the way of life has remained almost totally unchanged by the modern inventions and it is like going back hundreds or even thousands of years. They are today exposed to accelerating environmental and social changes; although change is inevitable and desirable when it improves the living conditions. A comprehensive study on the environmental and social changes in the entire Himalayas may be the need of time to identify and justify the methodology of change, which is

consistent with preservation of Himalayan Values, Heritage, Natural resources, Spectacular natural beauty and distinctive culture/ tradition of the area.

AREA INTRODUCTION

The total geographical area of the State is 7096 sq. km. but according to 1958-60 Survey Operation and the Gazetteer of Sikkim, the land area under different utilization categories is 7299 sq. km. Detailed break up is as follows:

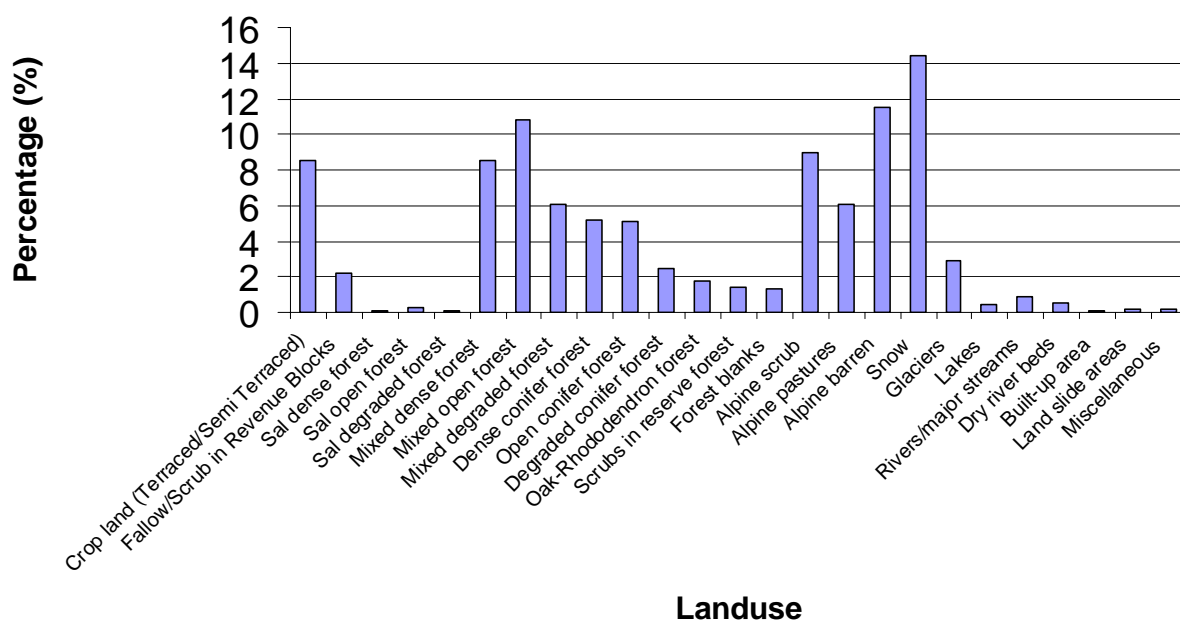
| Land use Pattern | Area In '000 ha | Area in % |
|--|-----------------|---------------|
| Barren Land | 209.01 | 28.28 |
| Land put to Non- Agricultural Use | 69.96 | 9.58 |
| Permanent pastures and grazing land including cultivable waste | 102.49 | 14.40 |
| Land under miscellaneous tree crops and grasses | 4.17 | 0.57 |
| Forest Land | 265.21 | 36.34 |
| Land under operational holdings | 79.06 | 10.83 |
| Total | 729.90 | 100.00 |

AREA STATISTICS FOR SIKKIM – TOTAL STATE (IN SQ. KMS.):

[Remote Sensing Data 1988]

Table 1.2 Area Statistics of Sikkim

| Sl. No. | CLASS | RESERVE FOREST | REVENUE BLOCK | TOTAL | % OF TOTAL |
|---------|------------------------------------|----------------|----------------|----------------|---------------|
| 1 | Crop land (Terraced/Semi Terraced) | 0.00 | 604.85 | 604.85 | 8.52 |
| 2 | Fallow/Scrub in Revenue Blocks | 0.00 | 155.69 | 155.69 | 2.19 |
| 3 | Sal dense forest | 5.30 | 0.77 | 6.07 | 0.09 |
| 4 | Sal open forest | 15.93 | 1.54 | 17.47 | 0.25 |
| 5 | Sal degraded forest | 3.32 | 0.71 | 4.03 | 0.06 |
| 6 | Mixed dense forest | 464.46 | 138.88 | 603.34 | 8.50 |
| 7 | Mixed open forest | 433.37 | 333.38 | 766.75 | 10.81 |
| 8 | Mixed degraded forest | 194.56 | 235.06 | 429.62 | 6.05 |
| 9 | Dense conifer forest | 351.94 | 16.14 | 368.08 | 5.19 |
| 10 | Open conifer forest | 340.63 | 21.55 | 362.18 | 5.10 |
| 11 | Degraded conifer forest | 156.89 | 16.30 | 173.19 | 2.44 |
| 12 | Oak-Rhododendron forest | 100.34 | 26.24 | 126.58 | 1.78 |
| 13 | Scrubs in reserve forest | 101.87 | 0.00 | 101.87 | 1.44 |
| 14 | Forest blanks | 90.56 | 0.00 | 90.56 | 1.28 |
| 15 | Alpine scrub | 611.44 | 27.72 | 639.16 | 9.01 |
| 16 | Alpine pastures | 431.32 | 0.00 | 431.32 | 6.08 |
| 17 | Alpine barren | 815.80 | 2.35 | 818.15 | 11.53 |
| 18 | Snow | 1018.23 | 5.41 | 1023.64 | 14.43 |
| 19 | Glaciers | 208.23 | 0.00 | 208.23 | 2.93 |
| 20 | Lakes | 32.30 | 0.70 | 33.00 | 0.47 |
| 21 | Rivers/major streams | 31.81 | 32.50 | 64.31 | 0.91 |
| 22 | Dry river beds | 31.49 | 9.10 | 40.59 | 0.57 |
| 23 | Built-up area | 0.30 | 3.24 | 3.54 | 0.05 |
| 24 | Land slide areas | 5.37 | 5.16 | 10.53 | 0.15 |
| 25 | Miscellaneous | 6.93 | 6.30 | 13.23 | 0.19 |
| | TOTAL | 5452.39 | 1643.59 | 7095.98 | 100.00 |

Area Statistics of the State in Percentage

NATURAL RESOURCES:

The Sikkim Himalayas has excellent scope for value added eco-tourism and traditions, unique in Art, Culture, and Folks dances live in perfect harmony and it is one of the most peaceful states in the country. There is strong sense of community living with distinct commitment in the people to serve the society. They have the strong sense of volunteerism.

The State is bestowed with abundant natural resources. Covering just 0.2% of the geographical area of the country, it has tremendous biodiversity and has been identified as one of the **Hot Spot** for biodiversity. The Sikkim Himalayas that spread over Sikkim and the hill region of Darjeeling harbors more than 26 % of the flowering plants reported in the country and known to be an important phyto-geographical reserve of the country. Species wise, it has about 4500 Flowering plants, 550 Orchids, 36 Rhododendrons, 16 Conifers, 28 Bamboos, 362 Ferns and its allies, 9 Tree Ferns, 30 Primulas, 11 Oaks, over 424 medicinal plants, 144+ Mammals, 550 Birds, 48 Fishes and over 600 nos. of Butterflies and also 28 nos. of Mountains/Peaks, more than 38 Glaciers, 227 High altitude lakes & wetlands and over 104 rivers and streams.

Table 1.3 Wild Biodiversity at a Glance

| | |
|-----------------------------|------------------------------|
| Flowering Plants: 4500 | Orchids: 550 |
| Rhododendrons: 36 | Bamboos: 28 |
| Ferns and Ferns allies: 362 | Tree Ferns: 9 |
| Primulas: 30 | Oaks: 11 |
| Mammals: 144 + | Birds: 550 |
| Butterflies: 600 + | Fishes: 48 |
| Mountains & Peaks: 28 | Glaciers: 38+ |
| Lakes and Wetlands: 227 | Rivers and Streams: over 104 |
| Conifers: 16 | Medicinal Plants: 424 |

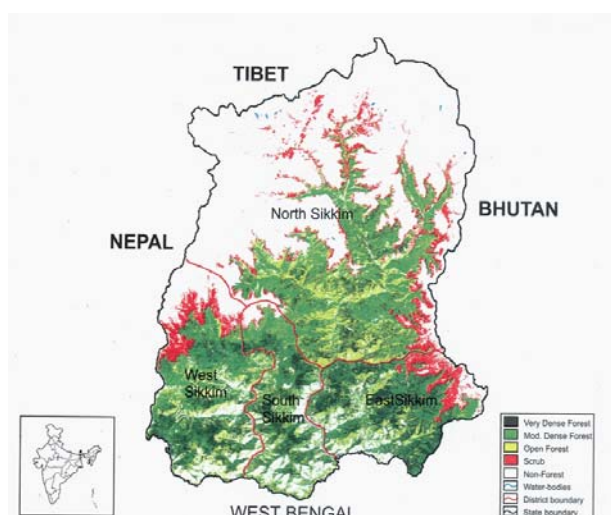
The abrupt telescoping of the terrain from the hot steamy foothill valleys to the arctic cold of the snow capped peaks, which has produced the marked altitudinal zonation in the rainfall, humidity, climate and vegetation is also responsible for the great variety and numerical abundance of the resident bird life, making Sikkim perhaps the richest area of its size anywhere in the world.

Forestry is the major land use in the State and nearly 82% of the total geographical area of the State is under the administrative control of the State Forest Department. This proportion is one of the largest in the country. The forest cover of the State is 46% of the total geographical area of the state. This figure is one of the largest in the country. There is one high altitude National Park (cum Biosphere Reserve) and six wildlife sanctuaries, which together constitute over 31% of the total geographical area of the state. Covering just 0.2% of the geographical area, Sikkim shows tremendous biological diversity.

Table 1.4 Sikkim Recorded Forest Areas

| | | |
|------------------------------------|--------------------|----------------|
| Reserved Forest | 5452 sq. km | |
| Protected Forest | 389 sq. km | |
| Total | 5841 sq. km | 82.31 % |
| Very Dense | 458 sq. km | |
| Moderately dense | 1904 sq. km | |
| Total | 3262 sq. km | 45.97 % |
| Total Forest and tree Cover | 3284 sq. km | 46.28% |

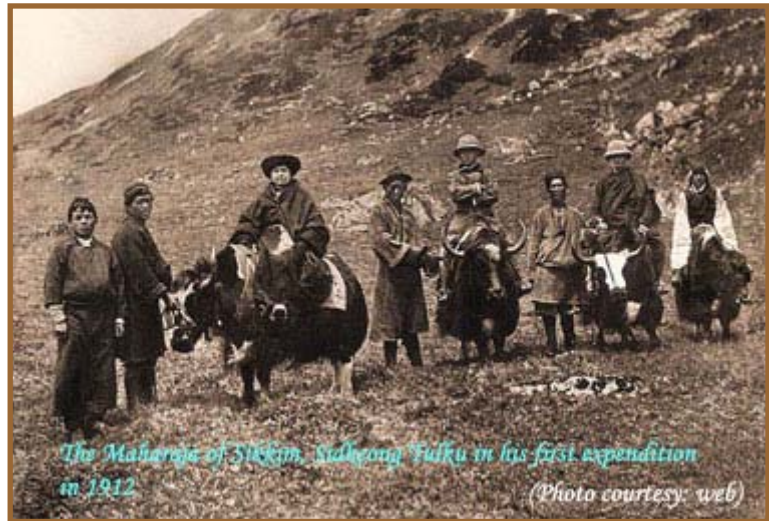
Map 1.1 Forest Cover of Sikkim



Source : Forest Statistics of Sikkim 2003

A BRIEF PAST HISTORY

The Tenth Chogyal (Maharajah) of Sikkim after completing his studies in Oxford University in 1908 was given the charge of Forests, Monasteries and Schools. The Forest Department was constituted in 1909. As per notification dated 15.05.1911 (F.D.), the Maharajah of Sikkim was declared a "Forest Officer." In 1909 the then Maharajah of Sikkim, Sidkeong Tulku, initiated the demarcation of the forest areas of the then Kingdom of Sikkim. Forests that were vital to the life support system and required full protection were set apart as Reserve Forests. These forests were to be left in their natural state and heavy penalties were imposed for illegal activities in these areas. Other forest areas that could be worked on a small scale in order to meet the timber and fuel-wood requirements of the local populace were carved out in the vicinity of villages. Those forests that were set apart in this manner to meet the wood requirements of the local people were called Khasmal Forests and those that were set apart as grazing grounds for the village cattle were called Goucharan Forests. Forest rules and regulations were first of all instituted during this period. He also introduced Avenue plantation of trees on either side of bridle paths of Sikkim through public participation. He passed regulations for conserving 50 yards on either side of rivers Rangit, Teesta and their tributaries as river / khola reserves. He passed regulations for compulsory bench terracing of the cultivable land of the farmers. "Whoever tills the land must bench-terrace."



PHYSIOGRAPHY

Physiographically, Sikkim can be said to have its feet in the ocean and its head in the sky. The altitudes vary from 300 meters to 8500 meters above mean sea level. The entire state is a young mountain system with highly folded and faulted rock strata at many places. It encompasses the lesser Himalayas, Central Himalayas and the Tethys Himalayas. Great Mountain ranging from 3000 meters to 8500 meters in height separates the state from surroundings. In fact, it has no flat piece of land good size any where. Major portion is covered by the pre-Cambrian rock and is much younger in age. The rock type consists of phyllites and schist's and therefore, the slopes are highly susceptible to weathering and prone to erosion and landslides. The trend of the mountain system is in general east-west direction. The mountains rise in elevation northward. The northern portion of the state is deeply cut into steep escarpments, and except in the Lachen and Lachung valleys, is not populated. Southern Sikkim is lower, more open, and fairly well cultivated. This configuration of the state is partly due to the direction of the main drainage which is southern. The Rangit and the Teesta which form the main channels of drainage, run nearly North-South. The valleys cut by these rivers and their chief feeders are very deep. The valleys are rather open towards the top, but usually attain a steep gorge like structure as we approach the bed of the rivers. There are 227 perennial lakes /wetlands at different altitudes. Many hot water springs i.e. Phur sachu, Ralang Sachu, Yumethang, Momay are also found in the State. The perpetual snow line in Sikkim may be approx. at 16,000 ft.

Soil of the region being the nutrient medium, is indispensable in vegetations. Soil moisture, mostly depending upon the soil thickness has an explicit impact on forest type and coverage in an area. The entire state primarily consists of gneissose rocks and half-schistose rocks. The soil developed from the gneissic group of rocks is brown clay, generally shallow and poor. They are typically coarse, often with ferric concentrations, neutral to acidic with poor organic/mineral nutrients. They tend to carry most of the evergreen and deciduous forests. The high intensity of rain fall in the state often causes extensive soil erosion and heavy losses of nutrients of land by leaching.

CLIMATE AND TEMPERATURE

Climatically, Sikkim experiences variable temperature with summer in the foothills and freezing winter on the high mountains. The climate of the state has been divided roughly into the tropical, temperate and alpine zones. The general trend of decrease in temperature with increase in altitudes holds good every where. For most of the period in a year, the climate is cold and humid as rainfall occurs in each month. The area experiences a heavy rainfall due to its proximity to the Bay of Bengal. The state receives an average annual rainfall of 500 cm. which is the highest in the Eastern Himalayas. The high density of rainfall causes extensive soil erosion and frequent landslides. The pre-monsoon rain occurs in April-May and the monsoon occurs normally from the month of May and continues up to early October. The temperature varies with altitudes and slope. The maximum temperature is recorded usually during the month of July & August and minimum during December & January. During the period from May to September, fog becomes a common feature in this area. Also during winter, snowfall is common in high altitude places. The mean temperature in the lower altitudinal zones varies between 4.5 °C to 18.5 °C, whereas at higher altitudinal zones, it varies from 1.5 °C to 9.5 °C with biting cold experience at high altitude places in the winter months.

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RAINFALL

An examination of available rainfall data shows that the mean annual rainfall is minimum at Thangu (82 mm.) and maximum at Gangtok (3494 mm.). An isohyetal analysis of these data reveals that there are two maximum rainfall areas (i) South-East quadrant, including Mangan, Singhik, Dikchu, Gangtok, Rongli etc. (ii) South - West corner including Hilley. In between these two regions, there is a low rainfall region e.g. Namchi. Rainfall in this area is about half of that in the former areas. There is a area in the North- West Sikkim which gets very little rainfall (even less than 4.9 mm.) This area is having mainly snow-covered mountains. Rainfall is heavy and well distributed during the months from May to early October. July is the wettest month in most of the places. The intensity of rainfall during South -West monsoon season decreases from South to North, while the distribution of winter rainfall is in the opposite order. The highest annual rainfall for the individual station may exceed 5000 mm. and average number of rainy days (days with rain of 2.5 mm. or more) ranges from 100 at Thangu to 184 at Gangtok.

DEMOGRAPHY:

Sikkim is a multi-ethnic state and broadly the population can be divided into Tribal and Non-Tribal groups. As per the 2001 census of India, the total population of the state is 5,40,851 whereas in 1991 it was 4,06,457 only. The Decennial growth in 1981-91 was 28.47 % whereas for 1991-01 it is 32.98 %. The overall density of population in the state is 76 per sq. km. East district is the most populated (population density 257) and North district is least populated (population density only 10). Sex ratio (Females per thousand Male) in 1991 was 878, whereas in 2001 is 875. There are only eight urban towns and urban population is 11.10 % of total population. Schedule caste and schedule Tribe population is 5.93% and 22.36% respectively. North district is a tribal district as it has about 55.38% tribal population. Literacy rate is 69.68 % higher than the all India average literacy rate of 65.38 %.

Per capita GSDP is Rs 23,786=00, Natural Growth rate is 16.90 per thousands, Per capita outlay on education is Rs.1288=00, Per capita forest cover is 0.61 ha and the Green Protection Index is .0903, highest in the country. In the year 2005-06, the per capita income is Rs. 26,851=00, literacy rate is 82 %, Number of colleges are 11, Number of Government schools are 782, number of religious organizations are 732, Forests cover 45.97%, Number of domestic tourists are 2,51,744, number of foreign tourist are 16,523, Power production is 165 MU, People below poverty line are 19.20 % and the Annual State revenue is Rs. 228.31 Crores.

ECONOMIC PROFILE:

The economy of Sikkim is mainly based on Agricultural and Animal Husbandry. Approx. 11% of the total geographical Area is under Agriculture. Agriculture is of the mixed type and still at the subsistence level rather than commercial level. The work force participation rate as per 1991 census is 40.44%. The female participation rate in Sikkim is also much higher than the national average. Cultivators account for the greater majority of the people in the state. Their percentage is 57.84%. Agricultural labourers as a whole constitute only 7.81% of the workers in the state. House holds and other industries are negligible, but other workers (Tertiary Sector) at the State level represent a good percentage of population. The decreasing ratio of other worker at the state level indicates the low level of economic diversification. The importance of Agriculture can be judged by the high % of population approx. 65% engaged in it. Animal husbandry is an integral part of the house hold economy of the region. There are certain house hold industries also which substantially adds to house hold incomes. The past one and half decade has witnessed a tremendous upward swing in various developmental programmes giving a new thrust to Sikkim's economy. This process has increased wage employment opportunities. Though most of the inhabitants are basically agricultural, they have diversified into tertiary jobs such as government services. Tourism is on of the important service sector business activity in the state. About 3 lakh tourists visit this tiny Himalayan state. Harnessing the hydro electric power is yet another important industrial activity undergoing in the state.

In 1975 when Sikkim got merged in the Indian union, developmental activities accelerated. The following are some of the growth indicators of Sikkim.

| Table 1.5 Growth Indicators of Sikkim | | |
|--|----------------|----------------|
| GROWTH INDICATORS | 2005-06 | 1993-94 |
| Per capital income (at current price) | 26,851 | 9,300 |
| GSDP (at current price) | 80,557 | 40,270 |
| Infant Mortality Rate Per 1000 | 33 | 46 |
| Literacy rate | 75 | 53.47 |
| Daily wage Rs | 85 | 20 |
| College nos. | 11 | 5 |
| Govt. School nos. | 782 | 264 |
| Religious Institution nos. | 732 | 358 |
| Forest coverage % | 45.97 | 43.95 |
| JFMC/EDC Committees nos. | 205 | 0 |
| Police stations nos. | 82 | 24 |
| Fire Stations nos. | 12 | 6 |
| Milk Productions (Lacs. ltrs) | 39 | 16 |
| Domestic Tourist nos. | 2,51,744 | 70,365 |
| Foreign Tourist nos. | 16,523 | 7,360 |
| Permanent Registered (SSI) Units | 391 | 243 |
| Power generation MU | 165 | 65.81 |
| Revenue from power Rs. in Crores | 27.1 | 4.17 |
| Consumer cooperative Societies Nos. | 574 | 253 |
| Cereals Productions MT | 93,000 | 89,000 |
| Annual Plan Outlay Rs. in Crores | 511.1 | 120 |
| State Revenue (2004-05) Rs. in Crores | 120.59 | 48.44 |

Source : DESME, Govt. of Sikkim