NATURAL RESOURCES OF SIKKIM

Sikkim, a mountainous state, owes its modern origin way back in 1642 A.D. when its kingdom was ruled by its first monarch Phuntsog Namgyal who was consecrated as the first king of Sikkim by three monks: Lhatsun Chhenpo, Nga-Dag Lama and Kathog Lama at Yuksam in western Sikkim. At that time, the territory of Sikkim was extended up to Limbuwan in the west, Chumbi Valley and parts of Bhutan in the east and the entire Darjeeling district in south. The capital of the state was Yuksam. The then king divided the state into twelve *dzongs* (district), placed each under a *lepcha dzongpan* (governor) for centralized administration.

In the next generation, the king Tensung Namgyal, moved the capital to Rabdentse in 1670 A.D. for security reasons. After a long gap, Tsudphud Namgyal, a king of the same dynasty, shifted the capital to Tumlong in 1814 A.D., as Rabdentse was considered to be too close to Nepal. During the period of Thutob Namgyal, the capital of Sikkim was again shifted in 1894 A.D. to Gangtok and since then it remained as the capital. As per the treaty of India and Sikkim, which was signed in 1950, the Indian Government took over the administration of the Sikkim. However, the Namgyal dynasty continued till the Sikkim acquired full democracy and become the 22nd state of Indian Union on 16th May, 1975.

The state is situated between 27°04′ 46″ and 28°07′ 48″ north latitudes and 88°00′58″ and 88°55′25″ east longitudes. The state is extending approximately 114 km from north to south and 64 km from east to west having total geographical area of 7,096 sq km. Rivers and mountains define the boundaries of Sikkim. The state shares its southern boundary, which is delineated by Rangit and other rivers, with Darjeeling district of West Bengal. Three sovereign nations, the kingdom of Nepal in the west, Bhutan in the east and vast stretches of Tibetan plateau of China in the north bound the state.

The state has four districts namely (a) East District, (b) West District, (c) North District and (d) South District with their headquarters at Gangtok, Gyalshing, Mangan and Namchi respectively. These districts are divided into nine sub-divisions, 166 panchayat units, 453 revenue blocks including forest blocks and special areas. As per 2001 census, the state has nine towns. The following table shows the detail administrative set up of the state (Table 1).

Table 1 Administrative Set up

District/	Total	No.	No.	Revenue block			Pan-	Pan-
State	area (in sq. km)	of Sub- div.	of towns	Total	Revenue Block	Forest Block	chayat Ward	chayat Unit
North	4226	2	1	53	45	8	103	20
East	954	3	4	134	120	14	273	50
South	750	2	2	145	135	10	255	45
West	1166	2	2	121	111	10	274	51
Sikkim	7096	9	9	453	411	42	905	166

Source: Census of India 2001

Sikkim has a very rugged topography and formidable physical features. The whole state is enclosed on three sides by lofty ranges and spurs of Greater Himalaya with varying heights on three sides. In the north, the Greater Himalaya is stretched in convex form while in the west, the Singalila range, which is a spur of great Himalaya, is extended from north to south and separates the state from Nepal.

The Donkya range, forming the eastern boundary of Sikkim, is much segregated with only two gaps, Nathu la and Jalepa la, which provide trade routes between Sikkim and Tibet.

The crowning glory of the state is the world's third highest mountain Mt. Khangchendzonga (8,596 m). It has five satellite peaks: Jano (7,710 m), Kabru (7,338m), Pandim (6,691 m), Narsing (5,825 m), and Siniolchu (6,888 m). The other important peaks are Rathong (6,087m), Simvo (6,811m) and Tolung (7,349 m). The northern portion of the state, particularly beyond Chungthang, is the highest region of the state and cut into deep escarpment. This region has no populated area except Lachen and Lachung valleys. Southern Sikkim is low and more open and fairly cultivated in patches. It is subjected to erosion by River Teesta and its tributaries.

Though the map shows six altitudinal zones but broadly it can be Physiographically divided into/following zones:

- a. **Lower hills:** It stands between altitude from 300m-1800m and has hilly topography with flat cultivated lands in patches.
- b. **Upper hills:** The altitude of this area is from 1800m-3000m. Major forest areas are found in this zone.
- c. **Alpine zone:** The area between 3,000m-4,500m is termed as Alpine zone. It is covered with scrubs and grassland.
- d. **Snow land:** The area above 4,500m is perpetually snow covered and is without vegetations

The general slope of the state is from north to south. However, the degree of slope varies from place to place. The slope in the whole North District, except Teesta valley below Chungthang and northeastern part of the East District, is 600m per km. Towards south, Teesta valley bellow Chungthang and the area around Rabongla in the South District, the slope is between 300-600m per km. The rest part of the state consisting whole West District, southern portion of South District and extreme southwest part of North District have slope 150m-300m per Km.

Glaciers are the important physiographic features of the state. They are mostly found in North district. The most important one is Zemu Glacier, which is 26 km in length and is situated at the base of Mt. Khangchendzonga. Other glaciers like Rathong, Lonak, Tolung, Hidden etc. are in the north-western part of the state. Some are also situated in the north-eastern part of the state. They are the source of important rivers in the state.

Sikkim is a hilly state with deep valleys and has different altitudinal zones. Its climate therefore varies from the hot tropical in the valleys to alpine cold in the higher altitudes. The climate of the state can be roughly divided into three climatic zones: (a) tropical climatic in the deep valleys with elevations up to 5,000 ft, (b) the temperate climatic zone having elevations between 5,000 ft to 13,000 ft, and (c) above 13,000 ft is the alpine climatic zone up to 16,000 ft. Above 16000 ft. it is perpetually snow bound. The temperature in the state varies according to altitude, rainfall and nearness to snow line.

The winter, which extends from November to March, is extremely cold and the minimum temperature in some places, particularly in north falls below the freezing point. Gangtok, the capital of the state shows some higher range of temperature in winter. Gyalshing, which represents the west, is little bit warmer than Gangtok. On the contrary, summer is short, mild and pleasant and lasts from April to May but the heat is quite oppressive in deep valleys during this period.

Like physiography, the rainfall also shows variations. The state experiences monsoon from June to October, when it rains heavily. March witnesses the onset of thunderstorms and its frequency increases till the rainy season sets in. Rainfall varies spatially according to terrain. It is heavier in central region consisting East District, southeast portion of North District, central part of South District, central and southwestern part of West District. These areas receive more than 2,400mm rainfall. The adjacent areas receive 1,200mm to 2,400mm of rainfall. The rainfall decreases substantially towards the north where it is almost dry and monsoon cannot reach easily. There is not much rainfall from November to February and the weather is clear in November and December. During winter, snowfall is common in high altitudes. However, the humidity is quite high in the morning and afternoon during the greater part of the year.

Teesta is the largest river of Sikkim. It flows essentially north-south across the length of Sikkim and divide the state into two parts. It is believed that it originates from Pauhunri glacier (Teesta Khangse) near Khangchung lake (27°59' N; 38°48' E, 7;128 m, above m.s.l.). Here, the river is known as Chhombo Chhu or Chumbu Chu. Flowing southward, the Teesta leaves the state and enter into West Bengal at Teesta-Rangit confluence near Teesta Bazaar and it ultimately joins Brahmaputra in Bangladesh. The narrow and serpentine Teesta in its upper part becomes swollen, swift, and muddy during monsoon and is full of rocks and hence is not navigable. Teesta and its tributaries receive the water from snow melting on the mountains as well as rain that accumulates during monsoon. River Teesta and its tributaries provide huge surface water resource for production of hydro-electricity in the state. Apart from small tributaries, Teesta receives the water of Zemu and Rangyong rivers on its right bank and Lachung (Sebojung), Dick Chhu, Rongni and Rangpo rivers on its left bank. The Great Rangit which is the most important right hand tributary of Teesta, is the other important river of the state. Its main tributaries are Rathang, Kalei, Rishi and Rangbhong. Based on Central Soil & Water Conservation Research & Training Institute, nine sub river basins/catchments have been demarcated on the map. These sub-basins may be very useful for the purpose of land use planning particularly in the state like Sikkim.

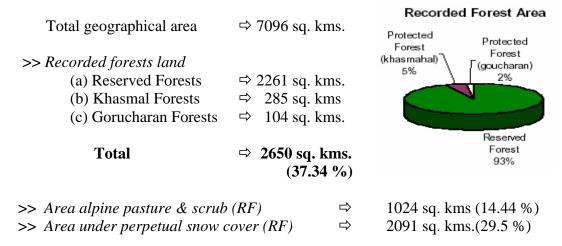
The pre-cambrian gneissic and Daling group of rocks with some intermediatories cover the major portion of the state. Gneissic group constitutes mainly of Himalaya. The Daling group consists of predominantly phyllites and schist. The slopes on these rocks are highly susceptible to weathering and prone to erosion and landslide. Number of important and some lesser known occurrences of minerals are found in the state. Copper, limestone, dolomite, graphite, asbestos and coal occur in the different parts of the state.

As the major part of the Sikkim lies on Darjeeling gneiss, the soil developed from this rock is brown clay, generally shallow and poor in lime, magnesia, phosphorous and nitrogen. However, it is quite rich in potassium. The texture of soil is loamy sand to silty clay loam. The depth of the soil varies 30 cm to 150 cm and in some cases even more than 150 cm.

The soils are typically coarse with poor organic mineral nutrients. The soil map of Sikkim is drawn on the basis of generalized soil sub-groups prepared by National Bureau of Soil Survey and Land Use Planning.

Sikkim is very rich in flora and fauna. Nowhere in the world in such a small area can find almost all varieties from tropical to alpine. The southern part of the state between 500 ft to 5000 ft has tropical forest including figs laurel, sal trees and bamboos. The area between 5,000 ft to 13,000 ft is dominated by temperate forest of oak, chestnut, birch, magnolia and silver fir. Juniper, Cupressus and Rhododendron grow in alpine zone above 13,000 ft. The perpetual snow areas that have been included in forest area by the Government of Sikkim, lie above 16,000 ft. They together constitute 82.32 % of total geographical area as forest land.

I. Forest Area Details as per the State Records:



Thus the total recorded forest land in the state > 81.28 % of total geographical area and the Revenue area = 1643.59 sq. kms.

II. (a) Forest Cover in Different Assessments (1987-2003):

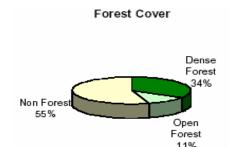
As per the State of Forest Report of the Forest Survey of India, Ministry of Environment & Forest, Government of India, the Forest Cover assessment Status in different status in different reported year is as under:

Year	1987	1989	1991	1993	1995	1997	1999	2001	2003
Forest Cover	2,756	3,041	3,041	3,119	3,127	3,129	3,118	3,193	3,262
Assessment (in sq.									+ 22
kms.)									Pvt.
									Forest
Geographical areas	38.84	42.86	42.86	43.95	44.06	44.1	44	45	46.28
(in %)									

Note: In the State of Sikkim about 44% of Total Geographical areas is under Alpine pasture & scrub and under perpetual snow cover and hence in these areas, it would not be possible to bring the tree cover.

(b) District- wise Forest Cover (Assessment year 2001):

	Casamahisal		Forest	Cover		
District	Geographical Area	Dense Forest	Open Forest	Total	Percent	Scrub
East	954	571	99	670	70.23	85
West	1,166	570	142	712	61.06	52
North	4,226	836	465	1,301	30.79	204
South	750	414	96	510	68.00	0
Total	7,096	2391	802	3,193	45.00	341



Forest Cover (2001)					
Dense Forest	2391 sq. km				
Open Forest	802 sq. km				
Total	3193 sq. km				
Of State's Geographic area	45.0 %				
Of country's Forest Cover	0.5 %				

Forest & Tree Cover (2001)					
Total Forest & Tree Cover	3,207 sq. km				
Of State's Geographic area	45 %				
Of Country's Forest & Tree Cover	0.4 %				
Per capita Forest & Tree Cover	0.59 Ha				

Tree Cover (2001)						
Culturable non- Forest Area	443 sq. kms					
(CFNA)						
No. of Trees per ha of CFNA	14.7					
Tree Cover	14 sq. kms					
Of State's Geographic area	0.2 %					
Of CFNA	3.2 %					

Rich flora and fauna has helped in creation of many sanctuaries and national park. The state has developed one National Park and six sanctuaries. The Khangchendzonga National Park covers an area of 1,784 sq km which represents 25.14 % of the land area of Sikkim. It is one of the few high altitude protected areas in the country providing natural habitat to snow leopard, Himalayan black beer, red panda(State animal), musk deer, blue sheep, Himalayan thar etc. The state has two rhododendron sanctuaries. Shingba which is located in Lachung valley in North District at a distance of 137 km from Gangtok; and the other is Barsey Rhododendron sanctuary located in extreme west in West District. These two sanctuaries are known for their unique abundance of rhododendron that blooms in different colour at their best during the month of May. These sanctuaries also have important fauna like red panda, Himalayan black beer etc.

East District has three wildlife sanctuaries. Fambong-Lho Wildlife Sanctuary is located at a distance of 25 km from Gangtok. Kyongnosla Alpine Sanctuary is located on the way to Nathula at distance of 31 km from state capital. The important varieties of fauna in these two sanctuaries are serow, goral, barking deer, red panda etc. Kyongnosla Alpine Sanctuary preserves *Cypripedium liberticum* the ground slipper orchid which is on the verge of extinction. *Rhododendron nevium*, the state tree of Sikkim is also found here. Pangolakha wildlife sanctuary is a new establishment and it is being developed by the Forest Department of the Government of Sikkim. Another important wildlife sanctuary is Maenam Wildlife Sanctuary in South Sikkim. It inhabits Himalayan black beer, musk deer, red panda, barking deer, Himalayan Thar and other faunal species.

Dense growth of forest, mountains and hills do not leave much land for cultivation. The cropland area (irrigated & non-irrigated) occupies 60,618 ha that is 55.57 % to total cultivated land and 8.54 % to total geographical area. The forest occupies 5,84,140 ha and covers 82.32 % land of the state. Only 17.68 % area is available for other purposes including cultivation.

Sikkim is land of villages and agriculture is the main occupation and is well established in comparison to the other northeast states. The land available for agriculture is situated from an elevation of 300 m to 3000 m but most of the cultivated areas lies below 1,800 m elevation. In Sikkim, most of the area of cultivable land is terraced and farmers have settled in their holdings and developed a regular cropping pattern. The main cereal crops of the state are maize, rice, wheat barley and buck wheat. The maize is staple food and grown on tropical and sub-tropical zones of Sikkim. It occupies 64 % area to total cropland. Rice is another important crop of river valleys. It is cultivated only on 17 % area of cropland whereas wheat occupies only 7.50 % area. On soils, which are not suitable for these crops, other cereals are raised which share 11.50 % area of total cropland. Pulses have very little share. They constitute only 8.33 % while oil seeds represent 14.76 % to total cropland.

The physiographic and climatic conditions of the state also permit to grow other crops such as fruits, potato, ginger, large cardamom and vegetables. Orange is the main fruit and is grown in the tropical & sub-tropical region of the state. It is cropped on 4,259 ha of land out of 6,745 ha under fruit production. Potato is grown on 4,690 ha of land. Further, about 4,816 ha area is recorded for ginger production. Vegetables are grown on 6,790 ha. Cardamom is an important commercial crop. The state has the largest area and highest production of large cardamom in India. It occupies 24,161 ha of land that counts 22.15 % to total cultivated land. The crop intensity in the state varies from one district to other. The North District has multiple cropping patterns *i.e.* maize-rice-wheat-oilseeds. The East District and West District have three cropping pattern consisting maize-rice-barley and maize-rice-oilseeds respectively. Double cropping pattern (maize-oilseeds) is in practice in South District.

Sikkim is famous for its natural beauty. Nestled in the lap of Himalaya and having panoramic view of the picturesque mountains with snow capped peaks, serene and sacred lakes, roaring rivers, mystical valleys, Sikkim sets itself as paradise for tourists, walkers and trekkers. The World's third highest peak Mt. Khangchendzonga attracts the mountaineers from all over the world. However, this peak is considered to be sacred and not open for mountaineering.

There are about 200 monasteries in Sikkim belonging to Nyingma and Kagyu order. They influence the cultural heritage and life style of the people of the state. Few important monasteries are Rumtek, Tsuk-La-Khang and Enchey in East District, Ralong in South District, Pemayangtse and Tashiding monasteries in West District and Tolung and Phodong in North District. Glaciers and lakes are the most attractive features for the tourists.

On the highway between Gangtok and Nathula at a distance of 34 km from Gangtok lies serene Tsomgo lake (Changu) at an altitude of about 10,000 ft. Khedchopalri Lake is another well known lake in West District. Green and Samiti Lakes are some other natural beauty of the state. Furthermore, the adventure tourism including river rafting and trekking are fast becoming popular in Sikkim. There are only few places in the world that can offer as many varieties of adventure tourism as in Sikkim. River rafting which is known as "White Water Adventure" represents major attractions for tourists. It is undertaken in lower parts of both, Teesta and Rangit rivers. The Teesta expedition is taken from Makha to Rangpo *via* Sirwani. The Rangit experience is taken from Sikip to Melli trough Nayabazar and Majitar.

Only roads can not lead to the real beauty in Sikkim. The breathtaking view of mountains, cool serenity of the lakes and water falls, the rustle of the leaves of thick forests and the murmur of gentle streams are those inaccessible parts of the beauty that can only be seen by trekking. The state has good number of trek routes and related infrastructures such as trekker's huts, drinking water, lodging facility, medical facilities to facilitate the trekkers. Thus, Sikkim is a very good destination for tourism. The number of tourists both, domestic and foreign is increasing every year. It is expected that Sikkim may be the new destination of the current millennium and tourism may be the most flourishing and viable industry for the economic growth of the state in time to come.

Sikkim is not industrially developed. However, the government is making sincere efforts to promote small scale as well as medium scale industries based on agriculture and forest products. Three industrial estates at Marchak in East District, Salghari and Jorethang in South District have been earmarked and infrastructures are being developed by the Government of Sikkim for the promotion of industries in the state. Apart from small scale industries, the state has three medium scale industries and three public sector units (PSU). Temi, the only tea state in Sikkim with an area of around 400 acres, has earned a reputation both in domestic and foreign markets for its superior quality of tea. A number of industrial units have come up in the state in the area of fruit jams and juices, bakery products, beer plastic goods, wristwatches and leather goods etc. At the same time, consistent efforts are being made by the government to preserve and promote traditional arts and crafts such as wood carving, cane and bamboo work carpet weaving, *thanka* painting and traditional handlooms.

The state of Sikkim is entirely dependent upon road transport as there is no air and rail links. The nearest railway station is New Jalpaiguri and airport at Bagdogra in West Bengal. The 41 km stretch of National Highway 31 A runs through state from Rangpo to Gangtok. The state has 186 km of state highways and 1546 km as other roads. Besides, the Border Road Organization is also constructing and maintaining roads particularly adjacent to China and Bhutan borders.

Sikkim is sparsely populated state having total population of 5,40,851 persons comprising of 2,88,484 males and 2,52,367 females. As already mentioned, Sikkim is absolutely an agrerarian state as its 88.93 per cent population is residing in rural areas and are concentrated in river valleys of the southern part of the state.

Unfavorable physiographic and climatic conditions do not permit habitation in northern part of the state. Therefore, the population in this part is very sparsely distributed that too only in Lachen and Lachung valleys.

The pace of urbanization is very slow in the state. Only 11.1 % population is residing in nine towns of the state. The population of the state capital Gangtok is only 29,162. Upper Tadong, which is next in population hierarchy, has 14,670 populations. Singtam has 5,431 populations. Other remaining six towns have population individually less than 5,000. The state has only 5.02 % as scheduled caste and 20.60 % as scheduled tribe. The sex ratio of the state is 875 females per 1000 males. The literacy rate is 75 %.

DISTRICT WISE NAME OF IMPORTANT TOURIST SPOTS

	East	West			North		South
1	Rumtek Monastery	1	Pelling	1	Kabi Lungechok	1	Namchi
2	Enchey Monastery	2	Singshore Bridge	2	Phodong Monastery	2	Tendong Hill
3	Cottage Industry	3	Khedchopalri Lake	3	Lachung	3	Temi Tea Garden
4	Flower Show	4	Yuksom (Yuksom)	4	Yumthang	4	Maenam Hill
5	Tibetology	5	Pamayangtse Monastery	5	Phensong Monastery	5	Phur Tsa- Chu
6	Chorten	6	Sanga Choling Monastery	6	Chungthang	6	Rabongla
7	Saramsa garden	7	Dubdi Monastery	7	Singik	7	Jorethang
8	Hanuman Tok	8	Geyzing Bazar	8	Lachen	8	Kitam
9	Ganesh Tok	9	Varsey	9	Tholung Monastery	9	Samdruptse
10	Tashi View Point	10	Rabdentse Palace Ruins	10	Kishong Trek		
11	Nam-Nam View Point	11	Dzongri Trek	11	Gurudongmar Lake		
12	Changu lake	12	Yambong Trek				
		13	Narsing Trek				

AREA STATISTICS FOR SIKKIM - TOTAL STATE (in Sq. km.)

SI.No.	Class	Reserved 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	90.56	1.28
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	River / 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

WILDLIFE (PROTECTED AREA NETWORK)

SI No.	Name	Area in Sq. km.	District	Biogeographic Province	Altitude	Notification Dated
1.	Khangchendzonga National Park	1784.00	North & West	2C		August 1977
2.	Barsey Rhododendron Sanctuary	104.00	West	2C	2200-4100m	08.06.96
3.	Fambong-Lho Wildlife Sanctuary	51.76	East	2C	1524-2749	02.04.84
4.	Kyongnosla Alpine Sanctuary	31.00	East	2C	3292-411m	05.12.92
5.	Maenam Wildlife Sanctuary	35.34	South	2C	2300-3263m	09.03.87
6.	Pangolakha Wildlife Sanctuary	128	East	2C		07.11.00
7.	Kitam Bird Sanctuary	6.00	South	IB, 2C		16.02.05
8.	Shingba Rhododendron Sanctuary	43.00	North	2C		August 1984

TREKKING ADVENTURE

Sl. No.	Name of Important Trek	Places Covered	Suitable Month for Trek
1	Monastic Trek	Pemayantse-Sangacholing, Khedchopalri- Dubdi -Sinon-Tashiding - Ralong	March-May/Oct-Dec
2	Rhododendron Trek	Naya Bazar-Hilley/Soreng Dentam- Pemayangtse Varsey	March-May
3	Khangchendzonga Trek	Yuksom-Bakim-Tsokha- Dzongri- Lamune and Back	Mid March-Mid May Mid Oct to Mid Dec
4	Coronation Trek	Rumtek-sang- Yangang Rabongla- Tashiding- Yuksam	Oct-Dec
5	Areylungchok-Dzongri Trek	Labdong-Kasturi Urar- Chamrey- Thangsing- Lamune- Dzongri- Yuksom	Mid March-Mid May Mid Oct to Mid Dec
6	Yambong Singalila Trek	Nambu- Chongri- Yambomg- Dzongri- Thangsing- Lamune- Dzongri- Yuksom	Mid March-Mid May Mid Oct to Mid Dec
7	Narsing Himal Trek	Borong- Pokhri- Thumki- Phedi Urar- Tin Devanay and Rani Taar	Mid March-Mid May Mid Oct to Mid Dec
8	Tholung - Kishong Trek	Bay- Tholung- Tholpe- Dawathang- Shingo- Thepala- Pach Pokhri	Mid March-Mid May Mid Oct to Mid Dec