

Sikkim Glaciers

Your journey to Sikkimese Glaciers begins with Lachen. This town in northern Sikkim is about 120 kilometers away from Gangtok. Along the way, you'll pass through a number of notable places, including Tashi View Point, Kabi Longstok Village, and Phodong Monastery, to name a few.

After an overnight stay in Lachen, you'll be ready for a quick jeep ride to Zema. Peeking outside the window, you see the Zemu river racing parallel to the road at a height of 3,240m and fresh air welcomes you to Talem. As you approach Jakthang from there, the terrain becomes smoother. The rhododendron crowd here is a vibrant display of color against the clear blue sky.

The trek will now take you through a series of ascents and descents, mesmerizing you with the sight of the World's third-largest peak, Kanchenjunga until you reach the terminus of the staggering beautiful glacier, that is Zemu Glacier at Yabuk. This glacier is the creator of the stunningly blue-green Teesta river which is essential to the state of Sikkim. Waterfalls, wildflowers, and many other mystical wonders are what you will witness here on this trek.

Location and geology

Zemu Glacier

Zemu Glacier is the largest glacier in the Eastern Himalayas stretching about 26 kilometers (16 mi) in length with an average width of 1 Kilometer. It is located at the base of Kangchenjunga (Kanchendzonga) in Sikkim, India. The Zemu Glacier cascades the east side of Kanchenjunga. The glacier is the source of water for several rivers, most importantly river Teesta which later joins the Brahmaputra.

Rathong glacier

The Rathong glacier is situated in Western Sikkim. It feeds the Rathong river. The glacier stretches from Rathong La in the north to the height of Chowrikang Valley in the south. The glacier is supplied by Ice Falls of Kabru group and Mount Rathong at the height of 6678 meters.

Lonak glacier

The Lonak glacier is located in north-eastern Sikkim. It contributes to the Lhonak river which is a tributary of the river Teesta. The Lhonak valley is popular for its Tran Himalayan grasslands adorned by glacier lakes, boggy marshes, and barren scree slopes.

Dawdling frozen rivers of ice, this glacier of the Sikkim-Himalayas, provides water to those running in the Indo-Gangetic plains. The conglomeration of snow over millions of years on this mighty range has led to the formation of this glacier. The upper layers of the snow exert pressure on the lower layers molding them into ice. Again, the pressure combined with the gravitational force makes the glaciers move.

Popularly known as 'nature's bulldozer', these solid rivers gather up everything that comes in their way creating gullies, snow bridges, glacial lakes, valleys, glacial troughs, icefalls, crevasses, and moraines. They create remarkable changes in the topography of the earth. As these nature's own freshwater reservoirs flow downward, there is a temperature rise and so they liquefy to form rivers rich with alluvial soil.

Several tributary glaciers supply the main glacier. The side valleys in which these glaciers lie, conjugate into the main Zemu Valley from different directions. Waterfalls and icefalls are formed at the junction of the tributary glaciers with the

Zemu glacier.

In northern Sikkim are the drier valleys lying in the rain shadow of the main Himalayan range. These areas have cold desert-like conditions, although the aridity is much less than that of regions like Ladakh. The normal elevation is more than 3,000 m with extremely rough terrain. The region has two major valleys in the region – the Lanchung Valley and the Lachen chu Valley.

Both the Lanchung and Lachen chu rivers are tributaries of the river Teesta. The latter narrows down visibly in its higher reaches before taking a sudden turn through the gap at Gagong at the bottom of the spectacular Chomoyomo mountains. Here the terrain converges with the head of the Lanchung Valley over the 6,000 m high Donkya La Pass across which the plateau first descends and then rises towards the Indo-Tibetan border.

The two main mountain ranges of the tract are the Chomo Lhari and Donkya mountains. Two major passes across them are the Jelep La and Nathu La, both having an elevation of more than 4,000 m.

Significance

The Teesta River is fed by the epicenter of a hydropower development project being embarked upon by the Government of Sikkim. To this date, 510 MW of the proposed 3500 MW potential are being operated. This is one of a kind, run-of-the-river project, with the water extracted from the river without the help of a dam, running along the valley wall and poured back into the river through a cascade of turbines. The natural run of the river is much less expensive than using a dam in this earthquake-prone, mountainous, remote valley.

A permanent base camp has been set up by the Himalayan Mountaineering Institute at Chowrikiang to train the disciples

with Ice crafting in Rathong glacier. Thus it is a popular place for mountaineers and trekkers.

The Lhonak valley although inhabitable except for some occasional settlement for nomadic Tibetans is a region of strategic importance. Being the last outpost of the Indian Army in the extreme northeastern part of Sikkim, the area remains under constant vigil of the Brave men in camouflage to monitor the Nepal-Tibetan border.

The natives consider the snow-covered mountains to be the abode of gods. The legendary undocumented creature Yeti or abominable Snowman is believed to roam the length of the slopes.

History

The Zemu glacier was first visited by T. J. Hoffman, a famous photographer in Calcutta, and Claude White, Political Officer in Sikkim in 1891. The glacier was again visited in 1899 by D. W. Freshfield and in 1910 by LaTouche.

In April-May 1965, an expedition was sponsored by the Geological Survey of India in the eastern Himalayas to study the general features of the Sikkim Glaciers. The work was a pioneer in the sense that this was the first time that refraction seismic surveys over a glacier had been undertaken in this country.

Biodiversity and Cultural heritage

Khangchendzonga National Park

Situated in the northeastern Indian State of Sikkim, Khangchendzonga National Park (KNP) presents one of the widest altitudinal ranges of any protected area in the world. The Park has a remarkable vertical sweep of over 7 kilometers (1,220m to 8,586m) within an area span of only 178,400 hectares and comprises a unique diversity of lowlands, steep valleys, and astonishing snow-clad mountains including the world's third-highest peak, Mt. Khangchendzonga. Numerous lakes and glaciers, garnish the barren high altitudes.

The property is located within the Himalaya biodiversity hotspot and exhibits a peerless range of sub-tropical to alpine ecosystems. The Himalayas being narrowest as this region results in extremely steep terrain which accentuates the distinction between the various eco-zones featuring in the property. The Park is located within a mountain range of global biodiversity conservation significance and covers 25% of the State of Sikkim, acknowledged as one of India's most significant biodiversity concentrations. The park is inhabited by a significant number of endemic and threatened plant and animal species. And has one of the highest numbers of flora and fauna recorded in the Central or High Asian Mountains.

Khangchendzonga National Park's prestige is undeniable. The combination of extremely high and rugged mountains covered by intact old-growth forests up to the unusually high timberline further adds to the exceptional landscape beauty.

Mount Khangchendzonga and many natural features within the property and its wider setting are embellished with rooting cultural meanings and sacred significance, giving form to the multi-layered landscape of Khangchendzonga, which is sacred as a hidden land both to Lepchas as Mayel Lyang and to Buddhists (Beyul), exhibiting a unique example of co-existence between different religious traditions and ethnicities, constituting

the base for Sikkimese identity and unity. The ensemble of stories, myths, and notable events, along with the scriptures themselves, convey and make manifest the cultural meanings projected onto natural resources and the indigenous and specific Buddhist cosmogenesis that evolved in the Himalayan region.

The native traditional knowledge of local plants and the local ecosystem, which is limited to local peoples, is on the verge of vanishing and represents a valuable source of information on the medicinal properties of several endemic plants. The traditional and ritual management system of the natural resources of the land forests pertaining to the Buddhist monasteries speak of the active dimension of Buddhist culture and could contribute to the property's effective management.

The park – with Mount Khangchendzonga and other sacred mountains – symbolizes the core seraphic region of the Sikkimese and syncretistic religious and cultural traditions. It bears unparalleled witness to the coexistence of multiple layers of both Buddhist and pre-Buddhist sacred virtues in the same region, with the throne of mountain deity on Mt Khangchendzonga. The property is central to the Buddhist understanding of Sikkim as a beyul, an intact site of religious ritual and cultural practice for Tibetan Buddhists in Sikkim, in neighboring countries, and all over the world. The sacred Buddhist importance of the place began with Guru Rinpoche's investiture of the Buddhist sanctity of the region in the 8th century and consequently appears in Buddhist scriptures such as the prophetic text named the Lama Gongdu, transcribed by Tertön Sangay Lingpa (1340-1396), followed by the initiation of the beyul in the 17th century, primarily by Lhatsun Namkha Jigme.

Mt. Khangchendzonga 8,586 meters above sea level cradles the western boundary of Khangchendzonga National Park and is one of 20 scenic peaks measuring over 6,100 meters located within the park. The combination of extremely high and bumpy

mountains blanketed by intact old-growth forests up to the unusually high timberline and the prominent altitudinal vegetation zones further adds to the extraordinary landscape beauty. These peaks have attracted people from all over the world, mountaineers, photographers, and those seeking spiritual enrichment. The park boasts eighteen glaciers including Zemu Glacier, Rohtang glacier, and Lhonak glacier, occupying an area of around 10,700 hectares. In total, there are about 73 glacial lakes on the property including over 18 clear and placid high-altitude lakes.

Khangchendzonga National Park is located within a mountain range of global biodiversity conservation significance and covers 25% of the State of Sikkim, acknowledged as one of the most significant biodiversity concentrations in India. The property has one of the highest levels of plant and mammal diversity recorded within the Central/High Asian Mountains. Khangchendzonga National Park is home to nearly half of India's bird diversity, wild trees, orchids and rhododendrons, and one-third of the country's flowering plants. It contains the amplest and most extensive zone of stunted forest in the Himalayan territory. It also provides a crucial refuge for a range of endangered and endemic species of flora and fauna. The national park exhibits an extraordinary altitudinal range of more than 7 kilometers in a relatively small area giving rise to an exceptional range of eastern Himalayas landscapes and associated wildlife habitat. This ecosystem mosaic provides a critical refuge for an impressive range of large mammals, including several apex predators. The park has confirmed six remarkable cat species as Leopard, Clouded Leopard, Snow Leopard, Golden Cat, Jungle Cat, and Leopard Cat. Flagship species include the Snow Leopard the largest Himalayan predator, large Indian Civet, Jackal, Tibetan Wolf, Red Panda, Goral, Himalayan Tahr, Blue Sheep, Mainland Serow, two species of Musk Deer, two primates, 4 species of pika and several species of rodents, including the particolored Flying Squirrel.

Environmental issues

Glacier retreat

The progressive thinning, shrinking and receding of the Sikkimese glaciers due to spiking temperatures and sudden rainfalls pose a grave threat to the millions who depend on these rivers for sustenance.

The Zemu glacier has been reported to recede at 27 meters per year from 1967-1984. Given the stretch of the glacier, the rate of retreat is fairly slow compared to others. The glacier has humongous debris covering it on most of its measure, insulating it from ablation. A closer look at the lower glacier indicates this heavy debris coating, with some small scattered glacial lakes on its floor. Similar is the fate of the other two glaciers.

Risk of Avalanches and Floods

Numerous tributaries no longer join the Zemu, depreciating a portion of its former volume. Near the head of the glacier, the walls of Kanchenjunga carry the debris and spit large amounts of snow in the form of avalanches to the glacier's base from a height of 5900 to 5200 meters.

The glacier receives considerable amounts from up to 8000 m via avalanches deposition. For the foreseeable future, the Zemu glacier will continue to be the chief source of water for the Teesta River. The glacier is yet to recede as fast or develop a proglacial lake as has happened in the case of Changsang glacier, South Lhonak Glacier, and Middle Lhonak Glacier. If ever the aforementioned situation occurs, avalanches and floods will become common incidents that will devastate the lives of local communities

Loss of cultural heritage

The region is the heartland of cultural diversities and immense knowledge of sacred text and natural medicines needs to gain widespread recognition. A glacier retreat may destroy the heritage of this extraordinary land.

Solutions

Research based approach

The glaciers need to be monitored and studied continuously over a period of time. There is a high need to make sure that there are permanent stations to study the rainfall, snowfall, melting etc of the glacier. With data collected over a period of time, it will be possible to determine the best steps forward to save the glacier and also make policies. Investment in saving the beautiful glaciers is the need and all should be supporting the same.

Education

The people need to be educated on the importance of glaciers and why they are needed to be supported and protected. Children in particular need to understand that harming the environment and these glaciers shall result in major problems in the future. The Local population needs to be made aware on how to protect the glaciers and take care of them. Adding the environment protection subjects in school and university curriculum can help a lot.

Responsible tourism

With more people coming to travel and visit glaciers, the fragile ecosystem is pounded with many unwanted elements.

Plastic, paper, bottles, waste, hiking equipments, human waste etc can be seen in almost all glaciers. The trekkers need to be made aware of the same and stopped from carrying all these and dump them in the glaciers and rivers. There needs to be control points and all harmful materials need to be stopped from entering the glaciers.

Conclusion

The region is the crux of a multi-ethnic culture that has evolved over time, giving rise to a multi-layered syncretic religious tradition, which revolves around the natural environment and its notable features. This rapport is expressed by the region surrounding Mount Khangchendzonga. It is a specific Sikkimese form of holy mountain cult which is sustained by frequently-performed rituals, both by the Bhutias and Lepcha people where the latter performs two significant rituals: the Nay-Sol and the Pang Lhabso. The harmony between the human communities and the glacial-mountainous environment has harbored the elaboration of a profound traditional knowledge of the natural resources and their properties, particularly within the Lepcha community. This region of Sikkim is the center of the socio-religious order, of the harmony and unity of the ethnically diverse communities of Sikkim which seeks recognition amidst retreat.