

Nepal Glaciers

“As they climbed higher and higher into the mountains, the air grew colder and the landscape more rugged. They were awestruck by the towering peaks and glaciers that surrounded them. They felt small and insignificant in the face of such natural grandeur. Nestled in the heart of the Himalayas, the glacier was a sight to behold. Its sparkling white surface stretched for miles, and its icy peaks reached high into the sky.”

Nepal is home to many glaciers, which are formed by the accumulation of snow and ice over time. These glaciers play a crucial role in the country's water resources, as they provide the headwaters for many of Nepal's rivers, which are essential for irrigation and hydroelectric power generation.

The Himalayas, which run through Nepal, are home to some of the largest glaciers in the world. The glaciers in Nepal can be divided into two main categories: valley glaciers and continental glaciers. Valley glaciers are found in mountain valleys and are smaller in size compared to continental glaciers. Continental glaciers are found at higher elevations and are much larger in size.

Location and Geology

Known as the largest Himalayan state in Asia, Nepal holds eight of the world's ten tallest mountains in its northern region, including the world's tallest mountain- Mount Everest. Prominent peaks like Kanchenjunga, Lhotse, Makalu, Cho Oyu, Dhaulagiri and Ama Dablam among many others also have the accompaniment of glacier formations. Known as the water towers of Asia, the Himalayas of Nepal have the largest concentrations of glaciers outside the polar region. The mountains also feed great rivers, including the Ganga and Indus, ensuring drinking water for millions of people. With most of the big glaciers situated on the eastern Himalayas,

the terrain of the mountains have been changed due to glacial activities. The western Himalayas receive small amounts of rainfall, thus barring the formation of vast snowfields. A persistent body of dense ice that is constantly moving under its own weight, glaciers form where the accumulation of snow exceeds its ablation (melting and sublimation) over many years, often centuries. Slowly deforming and flowing due to stresses induced by their weight, glaciers tend to create crevasses, seracs, and other distinguishing features. Abrading rock and debris from their substrate, glaciers also create landforms such as cirques and moraines.

Because glacial mass is affected by long-term climatic changes like precipitation, mean temperature and cloud cover, glacial mass changes are considered among the most sensitive indicators of climate change and are a major source of variations in sea level. Continued climate change is predicted to have a significant impact on the glaciers that is likely to have major changes in freshwater water flows. This in turn, affects biodiversity, people and their livelihoods. Important components of the global cryosphere, glaciers move, or flow, downhill due to gravity and the internal deformation of ice. Nepal Himalayas have 3,252 glaciers that cover an area of 5,323 km². The Koshi River basin comprises 779 glaciers, the Gandaki River basin consists of 1,025 glaciers, the Karnali River basin consists of 1,361 glaciers, and the Mahakali River comprises of 87 glaciers big and small. All of them have a very important impact on the lives of people in Nepal and India.

Ngozumpa Glacier

The Ngozumpa Glacier is the largest glacier in Nepal and the second largest in the Himalayas. It is located in the Sagarmatha National Park in the Solukhumbu District of Nepal and is a significant source of water for the Gokyo and Dudh Kosi rivers. The glacier is approximately 15 km long and 1.5

km wide, and has an estimated ice volume of over 27 cubic kilometers. The glacier is also home to a number of high peaks, including Cho Oyu and Gyachung Kang, which attract climbers from around the world.

Khumbu glacier

Similarly the Khumbu glacier is located in the same national park and it is the second largest glacier in Nepal. The glacier is the largest in the region and is a popular destination for trekkers and climbers who come to attempt to summit the world's highest peak. The glacier is also home to the famous Khumbu Icefall, which is a treacherous section of the climbing route to the summit of Mount Everest.

Rolwaling Glacier

Another well-known glacier in Nepal is the Rolwaling Glacier, which is located in the Rolwaling Himal mountain range. It is one of the main tributaries of the Langtang River. The Langtang River is a major tributary of the Trisuli River, which is itself a major tributary of the Narayani River. The Narayani River is one of the largest and most important rivers in Nepal, and it eventually flows into the Ganges River, one of the largest and most important rivers in India. This glacier is considered to be one of the most challenging to trek in Nepal, due to its remote location and difficult terrain. Despite this, it is a popular destination for trekkers and climbers who are looking for a more challenging adventure.

Imja Glacier

Imja Glacier is located in the Himalayas in the Solukhumbu district of Nepal. It is part of the Sagarmatha National Park, which is a UNESCO World Heritage Site. Imja Glacier is one of the tributary glaciers of the Dudh Koshi River, which is also

known as the Milk River. The Dudh Koshi River is a major tributary of the larger Bhote Koshi River, which is itself a tributary of the Sun Koshi River. The Sun Koshi River eventually flows into the Ganges River, one of the largest and most important rivers in India.

Langtang Glacier

The Langtang Glacier is another important glacier in Nepal, located in the Langtang National Park. This glacier is known for its stunning beauty, with the Langtang Lirung mountain towering over it. The glacier is also a popular destination for trekkers and climbers, with many trekking routes leading to the base of the glacier.

The climate in the glaciers of Nepal varies depending on the location of the glacier and its elevation. Generally speaking, the glaciers in Nepal are found at high elevations in the Himalayas, where the climate is cold and dry.

In the lower elevations of the glaciers, the temperature is relatively mild, with average temperatures ranging from 0 to 10 degrees Celsius. However, as the elevation increases, the temperature drops, and at the higher elevations, the temperature can be as low as -20 degrees Celsius. The annual precipitation in the region is low, and much of it falls as snow.

The temperature in the glaciers has been increasing over the past century, leading to a reduction in ice and snow cover. This is due to the global warming, which causes more melting of the glaciers and contributes to a change in the regional hydrology. The increasing temperature also causes the glaciers to retreat and reduce in size.

The weather in the region can also be quite unpredictable and can change rapidly, with heavy snowfall and strong winds common during the winter months. It's also important to note

that due to the high altitude and challenging terrain, the conditions in the glaciers can be quite dangerous and require proper planning, equipment, and experience to navigate safely.

Significance and Cultural heritage

The local communities rely heavily on the glaciers for their livelihoods. They use glacial meltwater for irrigation, drinking, and domestic use. They also use glacial rivers for hydroelectric power generation and transportation. The glaciers also play a crucial role in the region's tourism industry, as they are a major destination for trekkers and mountaineers.

The local communities living in the vicinity of glaciers in Nepal are primarily Sherpa communities. Sherpas are an ethnic group of people who have traditionally lived in the mountainous regions of Nepal particularly in the Solukhumbu district, including the areas surrounding the Khumbu and Ngozumpa glaciers. They have a deep understanding and knowledge of the glacier environment and have developed a unique culture and way of life that is adapted to the harsh conditions of the high mountains. They are known for their strength, endurance, and skill in climbing and trekking in the high mountains. Sherpa culture is deeply rooted in Buddhism, and many Sherpas are devout practitioners of the religion. They have a strong sense of community and tradition, and many of their customs and practices revolve around spiritual beliefs and practices. Traditionally, Sherpas were primarily engaged in agriculture, animal husbandry and trade. However, in recent years, many Sherpas have been employed as guides and porters for trekkers and mountaineers visiting the region. Sherpas are also involved in various other businesses such as lodges, restaurants, and trekking agencies.

Biodiversity

Sagarmatha National Park, where Imja Glacier is located, is home to a diverse range of flora and fauna. Some of the notable species found in the park include: The snow leopard which is an elusive and endangered big cat that is found in the high-altitude regions of the park, Himalayan Tahr a wild goat found in the park and other parts of Himalayan. Musk deer a small, elusive deer that is known for its musk glands, which are used in perfumes and traditional medicine. The park is known for its diverse range of pheasant species, including the Himalayan monal, blood pheasant, and cheer pheasant. Many species of birds can be found in the park, including the impeyan pheasant, the red-billed chough, and the Himalayan griffon. The park is also home to a diverse range of plants and flowers, including Himalayan blue poppy, Himalayan bellflower, Himalayan primrose and many more. Additionally, Himalayan black bear a large, omnivorous bear found in the park and other parts of the Himalayas, Red Panda a small, arboreal mammal native to the eastern Himalayas and southwestern China that feeds mainly on bamboo. Langur monkey a type of Old World monkey found in the park and other parts of the Himalayas. Several species of martins can be found in the park, including the Himalayan martin and the white-rumped swallow. Goral a small, goat-like mammal found in the park and other parts of the Himalayas. Dhole also known as Asiatic wild dog found in the park. Yak a long-haired domesticated bovid found throughout the Himalayan region of south Central Asia, the Tibetan Plateau and as far north as Mongolia and Russia. Many species of Butterflies, Moths and other insects can also be found in the park.

Langtang National Park is located in the central Himalayas in Nepal, and like Sagarmatha National Park it exhibits species like Snow leopard, red panda, pheasants, goral and flora like Himalayan blue poppy, Himalayan bellflower and Himalayan

primrose.

Environmental issue

Climate change has been causing the glaciers in Nepal to retreat at an alarming rate. A study published in the journal "The Cryosphere" in 2018, shows that glaciers in Nepal have been retreating at a rate of up to 35 meters per year since the 1960s. This retreat has led to an increase in the number of glacial lakes, which can pose a danger of outburst floods if their damming ice walls break. These floods can cause damage to downstream communities, infrastructure and the loss of life.

The Ngozumpa Glacier has been retreating at an alarming rate in recent years, due to climate change. Studies have shown that the glacier has receded by more than 1.5 km in the last century, and the rate of retreat has accelerated in recent years. This retreat has led to the formation of a number of glacial lakes, which are at risk of bursting and causing devastating floods downstream.

The retreat of the Ngozumpa Glacier also significantly impacts the local communities, who rely on the glacier for water, irrigation, and hydropower. The reduction in glacial meltwater has led to water shortages and reduced crop yields, affecting the livelihoods of thousands of people.

The melting of glaciers in Nepal also has significant implications for the country's water resources. The glaciers in Nepal provide the headwaters for many of the country's rivers, including the Ganges, the Brahmaputra, and the Indus. As the glaciers retreat, the amount of water they provide to these rivers decreases, which could lead to water shortages in the future.

The Government of Nepal has recognized the importance of

glaciers to the country's water resources and has taken steps to address the issue of glacier retreat.

The Government of Nepal and international organizations have been working to mitigate the impacts of the glacier retreat and promote sustainable development in the region. This includes measures such as the construction of dams and embankments to prevent glacial lake outburst floods and the promotion of alternative livelihoods for the local communities.

In 2010, the government established the National Adaptation Program of Action (NAPA) to address the impacts of climate change in Nepal. The government is also working to develop early warning systems for glacial lake outburst floods, as well as to improve the management of water resources in the country.

Solutions

Research Studies

To create solutions, one must dwell deeper into the issue, and keeping that in mind, scientists at the United States Geological Survey (USGS), in concert with the National Snow and Ice Data Center (NSIDC) and NASA, are developing a global inventory of all the world's glaciers to help researchers track each glacier's record. The inventory combines current information on size and movement with historical data, photos, and maps of each glacier. The purpose is to enable scientists to better connect changes in each glacier with any shifts in local climate, such as temperature or precipitation changes.

Wise use of resources

Effectively, alternative energy sources can be introduced and popularised to slow down global warming. Solar panels trap the heat from the sun which can later be converted to electrical energy. Wind turbines use the kinetic energy from the wind to generate power. Tidal and wave power utilize the humongous power of the ocean by harnessing the energy with generators placed on the ocean bed. Geothermal energy utilizes the heat from inside the earth. Biofuels such as ethanol can be produced by fermenting and mixing vegetables, grain waste, and fruit; ethanol has the remarkable potential of replacing diesel. Electric cars are battery-operated that do not rely on the highly polluting internal combustion engine; hydrogen fuel cells are being developed for these batteries. These are a few yet phenomenal ways to deal with global warming.

Individual Contribution

As an individual, you can contribute by using battery-operated vehicles or mass transportation services, reducing the waste generated from houses, fixing leaky taps, and switching off electrical devices when not required. Also when as a tourist, you visit sensitive areas, avoid littering the places. These seemingly little things make a large impact if they are done on a large scale, and they'll go a long way toward reducing your carbon footprint and saving the glaciers.

Conclusion

In conclusion, glaciers in Nepal play a crucial role in the country's water resources. However, these glaciers are facing the threat of retreat due to climate change. The government of Nepal has recognized the importance of glaciers and has taken steps to address the issue of glacier retreat, but more needs to be done to mitigate the impacts of climate change on

glaciers and to ensure the sustainable management of water resources in the country.

Despite the ongoing challenges, the Glaciers of Nepal remains a popular destination for trekkers and mountaineers, who come to experience the stunning landscapes and unique culture of the region.