

### IMJA GLACIER - NEPAL

NEAR 27.59°N 86.56°E

The Imja Glacier skirts the southern slope of Island Peak, Imja Tse, in the Himalayan Khumbu Range of Eastern Nepal, just southeast of Mount Everest. It originates on the western face of 7057 metre Kali Himal and is joined by Lhotse Shar and Ambulapcha Glaciers before it drains to the Imja Khota through the Dingboche Valley to the Dudh Koshi and the Ganges River to the Indian Ocean. Imja's proglacial lake, Imja Tsho, was born in the 1960s and continues to grow, filling the area left as the glacier front retreats, currently at the rate of nearly 10 metres per year. In Nepal, the average temperature has increased by 1.5 ° C since 1975.

Over the last three decades, the glaciology and mass balance of the Imja glacier have been studied by Yamada Tomomi of Hokkaido University's Institute of Low Temperature Science in Sapporo, Japan. The retreat of Imja glacier and the consequent threats are monitored by Samjwal Ratna Bajracharya and Sharad Prasad Joshi of the Nepalese development team working on the "Inventory of glaciers, glacial lakes and glacial lake outburst floods, monitoring and early warning system in the Hindu Kush-Himalayan Region"--a project sponsored by the United Nations Environment Programme (UNEP) and the International Centre for Integrated Mountain Development (ICIMOD).

Imja Tse was given the name Island Peak in 1952 by western climbers who marvelled at the sight of the mountain punching through a sea of ice- the converging flows of glaciers emerging from the highest mountain conglomerate on Earth. During a recent expedition, sponsored by UNEP, climbers found that Island Peak is no longer circled by dynamic ice flow-the ever-climbing Dingboche valley head is now a gravel-covered braided stream bed. The entire Dingboche valley is threatened by Imja's lake, 28 million cubic metres of water dammed behind an unstable terminal moraine.

As Imja Tsho's waters have been building, nearby tributary valleys have suffered damages from glacier lake outburst floods. In September of 1977, Nare glacial lake's moraine dam collapsed and the outburst took out a mini-hydroplant downstream. In August of 1985, Dig Tsho was hit by an ice avalanche and the resulting outburst destroyed a full hydropower plant installation, 14 bridges, and five lives. On the third of September of 1998, another ice avalanche into Tam Pokhari destroyed the impounding moraine taking many lives and causing nearly \$US2million of damages to the settlements downstream.

"Glaciers in the Himalayas are receding faster than in any other part of the world," according to Syed Iqbal Hasnain from the International Commission for Snow and Ice (ICSI) and the School of Environmental Studies of India's Jawaharlal Nehru University in New Delhi . "If the present rate continues, the likelihood of them disappearing by the year 2035 is very high."

The glaciers and snowpack of the Hindu Kush and Himalaya supply water to billions of people from the remnants of the Aral Sea to the ancient vast deltas on the China Sea, from the steppes of Mongolia to the mangrove swamps of the Bay of Bengal and the arid Indus shore on the



1961  
Erwin Schneider 1961, courtesy of The Mountain Institute



1995  
Alton Byers 1995, courtesy of The Mountain Institute

Arabian Sea. A high knot of mountains within 1000 miles of Imja Tse--the distance from Calcutta to New Delhi--supplies glacial headwaters to seven great rivers of Asia: the Indus, the Ganges, the Brahmaputra, the Salween, the Mekong, the Yangtze, and the Huang He.

The glaciers act as pan-seasonal water storage for Asia. Every year, the Himalaya discharges 8500 cubic kilometres of water, with 10% of that total coming from ice and snow melt. During the annual monsoon, while much of south Asia endures torrential rains and struggles against flood conditions, the cooler temperatures at altitudes of 2000 to 5000 metres above sea level turn that same abundance of precipitation to snow. When the rains and floods subside in the Asian lowlands, the high altitude snow slowly melts and maintains river levels for use in agriculture, industry, and domestic supply. As temperatures continue to warm, the annual snow pack disappears and the glaciers continue to feed this lifeblood supply of water downstream, supporting ecosystems and human populations through drought cycles. More than 2 billion people depend on the steady glacier-fed flow of these seven rivers.

In the Ganges basin alone, over 500 million people depend on their river's water. In recent decades irrigation projects have adopted technologies that extract water from underground aquifers, using diesel-powered pumps that have to reach to greater depths every year. The water from these aquifers also originates high in the Himalaya and recharge is dependent on snow and ice melt. While aquifers disappear, the mighty Ganges itself shrinks to a trickle during the dry season before it reaches the Bay of Bengal.

The effects of glacier loss on downstream ecosystems in Asia will be devastating. Deprived of freshwater supply during crucial months with no rain, primary productivity of forests, wetlands, and coastal swamps will plummet. In the Sundarban mangrove swamps alone, encroaching sea levels will combine with decreasing river supply and pressure from human populations to wipe out an ecological treasure that supports remarkable species such as the Royal Bengal Tiger, spotted deer, wild boar, Theses monkeys, and countless birds.

Himalayan ice is disappearing because of higher temperatures and changing precipitation patterns. Higher temperatures and changing precipitation patterns are climate change. According to the 2002 United States National Communication to the United Nations Framework Convention on Climate Change, "Greenhouse gases are accumulating in Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise... Human-induced warming and associated sea level rises are expected to continue through the 21st century." And the effects are already being felt by billions of people and countless other species dependent on the meltwaters of the Hindu Kush-Himalaya.

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