**Signs of Climate Change on Roof-top of the World**

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Glacial lake in the Zangskar valley, south western Ladakh. Photo: T.R. Shankar Raman

Today, global warming (climate change) has become a major concern across the planet. A flurry of investigations is being carried out to understand the causes of the recent climatic changes and there is a common consensus amongst scientists that the increase in the greenhouse gases in the atmosphere is the primary factor. The level of greenhouse gases has risen intermittently throughout the Earth's history, but has been fairly constant for the last few thousand years. With the increased burning of fossil fuels, their levels have shot up in the last century, warming up the earth's surface temperature. Melting of ice sheets in Polar regions and glaciers on the major mountain ranges such as the Himalaya, Alps and the Andes are being increasingly reported due to such warming. Researchers contend that most of the Himalayan glaciers will disappear before 2050.

The Ladakh region of the Indian Trans-Himalaya is being affected by these climatic changes. Recent studies at different stations in the region have shown that the temperature in the region is increasing annually by almost 0.20°C. Climatic models predict that the earth's surface temperature will increase by almost 5°C by the end of this century.

Would the oases in Ladakh survive such climatic change? Should the people of the region be concerned about shortages of water associated with global warming? These are the questions that have become more relevant today than ever before. Agriculture and livestock production have been the mainstay of the economy of rural Ladakh since time immemorial. Nevertheless, with the sustained climatic change in Ladakh as elsewhere on the planet, one wonders if the aforementioned sectors will continue to support the burgeoning population of Ladakh. Experts have suggested an acute scarcity of water all across the Himalayan region in this century. People of Ladakh are completely dependent on glacier run-off for irrigation and drinking water. Skirmishes over water for irrigation have not been uncommon in the past and may increase as the water level in the streams is declining fast.

Glaciers, the jewel in the crown of the Ladakhi mountains are melting apace under the intense heat of the sun. A recent preliminary study in the region showed that glaciers are retreating at an alarming rate of 7-10 metres per year. If they continue to melt at this rate, the glacial streams in Ladakh may reduce to trickles in the next couple of decades. The rapid melting of glaciers also causes erosion of agricultural fields and riverine pastures. Flashfloods have become a nightmare in recent years and the unprecedented heavy rain in 2005 and 2006 affected thousands of people as floods washed away agricultural fields and claimed more than a dozen human lives. The erratic climatic patterns are also threatening the multi-million livestock industry. The heavy snowfall in the winter of 2004-05 killed more than three thousand livestock (1,288 sheep, 1,789 goats, 128 yaks and 39 horses) in the Hanle valley of eastern Ladakh.

Ladakh a.k.a. Little Tibet, has many historical monuments and monasteries that attract a huge number of cultural tourists every year. They have managed to withstand high velocity winds and the intense sun heat of the arid Ladakh, but not rain, flashfloods and mudslides. Climate change is thus threatening these cultural and religious structures. Heavy rains in the last decade have caused major damage to unique murals of several monasteries including the monasteries at Alchi, the oldest, and at Hemis, the richest. Glacial lakes in Ladakh are also bursting, causing damage to human property. For example, the Shang valley was flooded in August 2007 due to such an incidence, when roads were destroyed and trees washed away.

The Indus river flows through Ladakh and frequent flooding from the tributary rivers of the Indus in the region will lead to increase in sea level. Trans-Himalayan glaciers supply millions of cubic feet of water to Asian rivers such as the Ganga, Indus and Brahmaputra. It is estimated that the melt of the glaciers in the Himalayan region contributed to more than 20 percent of the rise in the global sea level in the last 20 years as reported by World Glacier Monitoring Service (WGMS).

Global warming is also jeopardising winter sports all over the world, as the snowpacks from the mountains disappear. Ski resorts around the world are being hit hard by global climatic change. Although Ladakh is not a popular destination for winter sports, the Chadar trek, a week-long trek over ice-sheet on the frozen Zangskar river, which is very popular amongst adventurous tourists, would be affected. With changing climate patterns and increasing temperatures, the river may not freeze in winter. The rising temperature will also push animals and their habitats higher and higher until they are annihilated (IPCC, 2002). There have been reports of marmot colonies shifting upwards in several parts of Ladakh. The melting glaciers will inundate the critical habitats of migratory birds around glacial-fed lakes. There have been reports of the submergence of the habitats of the endangered Black-necked Crane from several wetlands in eastern Ladakh.

Melting glacier in Ladakh. Photo: T.R. Shankar Raman

Although there is anecdotal information of the negative impacts of climate change in Ladakh, there has been no study till now. With the growing concern of global warming affecting the livelihood of people in mountainous regions, it is imperative to initiate studies on the global warming-related issues in the region. In the meantime, it is the responsibility of all mountain dwellers to act sensibly and use mountain resources sustainably. One solution for the problem of global warming is to turn to other clean and environment-friendly sources of energy, which people in Ladakh have been doing for the last few years. Fortunately, more than 80 percent of days in a year are sunny in Ladakh and thus solar energy has been harnessed to meet energy requirements. Hydel projects have also been installed to generate electricity. Wind energy, especially in the eastern plains, is another option which needs to be explored.

**References**

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