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Climate Change : Impact on Himalaya, Melting of Glaciers, Associated Natural Disasters and Mitigation

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Climate change has been affecting the Himalaya mainly due to rise in global temperature. Himalaya is the youngest and highest mountain chain on earth and highly vulnerable to climate change. Himalayan glaciers are shrinking fast and more recently, climate change associated disasters like Glacial Lake Outburst Flood (GLOF) and Landslide Lake Outburst Flood (LLOF) have become very frequent in Hindukush- Himalaya region. Globally also the mountains are affected by major climatic changes with warming at higher altitudes. The collision of Indian Plate with Eurasian plate 50 million years ago, rise of Himalaya, onset of Indian Summer Monsoon, uplift of Tibetan Plateau and consequent impacts of global climate change, melting of glaciers are the burning issues today on third pole on Earth. A GLOF caused the recent devastating disaster occurred in the Uttarakhand Himalaya on 16th June, 2013 known as Himalayan Tsunami [Tewari,1,2,3]. Thousands of people were killed due to cloud burst in Kedarnath shrine, heavy monsoon precipitation which triggered flash flood and massive landslides. The Himalayan glaciers are retreating in the NW (J&K), Central (Himachal-Uttarakhand-Nepal) and NE (Sikkim) Himalaya in India and Nepal with the higher negative mass balance and recession rate [Pratap *et al.*,4]. The consequences of global climate change has been witnessed in the Himalayan glaciers since many small glaciers have disappeared and many lakes are growing in number and size. These lakes are posing a serious threat in future for GLOF and LLOF as already witnessed in the Chorabari lake in Kedarnath area. The detailed field study of Dokriani and Chorabari glaciers of Garhwal Himalaya have suggested that extreme rainfall events during 2011 and 2013 caused large amount of sediment transport, catastrophic debris flow and moraine dammed Lake Outburst events [Pratap *et al.*,4, Tewari, 1,2,3]. The remote sensing satellite data shows that GLOF in the Teesta basin, Sikkim Himalaya may be most vulnerable in future and needs attention.

The rain fall pattern in the western and eastern Himalaya has shown that precipitation is increasing in the northwestern and decreasing in the northeastern Himalaya. Heavy precipitation (cloud burst) in short time in Uttarakhand combined with western disturbances caused the extreme mountain weather event. The Uttarakhand extreme climate event and calamity could be used to understand these events in the entire Himalayan region and review the major hydropower projects planned in this fragile and seismically active zone of the Himalaya. The first major GLOF event in Hindukush – Himalaya was reported in Nepal in 1985, which destroyed the Namche hydroproject. Therefore, a systematic research on Glacial Lakes and associated outburst flood, their evolution and disappearance in the Himalaya needs to be focused and studied to understand the climate dynamics of this region.

[1] Tewari V. C. (2013), Himalayan Tsunami (key note address), In : 28th HKT, Tubingen, Germany

