

Himalayan Tsunami : Devastating Natural Disaster in the Uttarakhand Himalaya

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A devastating natural disaster occurred in the Uttarakhand Himalaya , northern India on 16th June , 2013 in which ten thousand people were killed due to massive landslides triggered by very heavy monsoon rain and cloud burst. The entire region around Kedarnath shrine was washed away in Kedarnath valley. Due to very heavy monsoon rain (400 mm) precipitation in entire Uttarakhand flash flood damaged the buildings, temples, bridges, hydro power projects in Bhagirathi, Mandakini, and Alaknanda river valleys. The calamity was horrible like the recent tsunami in Japan and few years ago in the Indian ocean. The Natural Disaster Management Authority of India , Indian Army and Air Force rescued the stranded people in the Garhwal mountains. This is the biggest ever natural disaster happened in the Indian Himalaya. There has been heavy loss of life and property in the area and it will take years to repair the road and return to normal conditions. The area ravaged is geologically fragile, falls in the seismic zones four and five, triggering seismogenic landslides. The damage to mountains alongside is more in areas that are weakened due to mining and with heavy rains even dormant landslides are activated. Mining and developmental activities in the river valleys disturbs a river's natural flow and forces it to follow a new course , making it more dangerous as happened in the current situation. Since it is a new developing state and the people had constructed the houses and commercial complexes on the Quaternary terraces near the river banks and road sides prone to landslides , the fast flowing rivers and rains damaged everything downslope [1] .

The mountain system of Himalayas is one of the youngest on planet earth and best to observe the processes of plate tectonics and its consequences as we see in Himalayas. The rise of Himalayas, the collision of plate and consequent impacts of global climate change , melting of glaciers are some of the most significant features available today on third pole on earth. The Indian plate movement to north approximately at the rate 5 to 6 cm/year is a great precursor of deformation of earth's crust in Himalayas. The rise and accommodation of the subducted and non subducted part of the Indian crust is an area of great geological observation and display of geodynamic processes rarely known anywhere else on earth.

Himalaya is also abode of snow and water tank of Indo – Tibetan region from where major rivers are originating and life line of the South Asian agriculture and energy. There are many examples of poor site selection for the constructions of buildings, roads, tunnels , hydro power projects etc in major river valleys of Ganga and Brahmaputra are directly built very close to the active and proven landslide zones in the Himachal, Uttarakhand, Arunachal and Sikkim Himalaya. Riverbed mining in Uttarakhand pushes up damage potential when the river floods in monsoon. The deforestation due to unplanned developmental projects and tourism are also very hazardous in this ecofragile system and environmentally sensitive areas of the Himalayas. National Geotechnical Facility (NGF) is undertaking an integrated geotechnical study of the selected site specific geological cross sections in the Himalaya across which the Ground Penetrating Radar (GPR) and bioengineering techniques besides soil mechanics and rock mechanics will be used for detection of subsurface tectonic features and paleoseismites etc. These integrated geotechnical investigations of NGF will help in stable and sustainable development of the Uttarakhand mountains in particular and Himalaya in general.

[1] **V. C. Tewari** et al. WIHG – IGU Workshop , June 11- 12, 2013: Modern Perspectives in Himalayan Geosciences, Abstract ,p.67

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