The Beas river floods 2023: a watershed moment for paradigm shift towards urbanization and development in the Higher Himalayan valleys

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The present study is done in the Beas river (Manali to Mandi town) after the July 2023 flood to assess the geomorphic and geological vulnerability of the terrain and understand the role of human intervention in the disaster. The study is based on preliminary field observations and morphometric analysis that indicates that the surfaces proximal to the trunk riverbed and the ephemeral tributary channels suffered maximum damage. Along the upper Beas river, the lateral erosion caused by hyperconcentrated flows saturated with paraglacial sediments partly obstructed the river and also increased the erosivity that also led to remobilization of midchannel bars along with the uprooted trees. In the downstream (southern mountain front), maximum damage was caused by activating seemingly dormant ephemeral tributary channels. The slope-channel coupling locally bulked the sediment supply of the trunk river. The disaster was force amplified when the river was temporarily obstructed by the manmade structures (e.g., suspension bridges), and most importantly, urban settlements (largely hotels) on the flood plain. Also, many public buildings suffered as these were constructed in/along the ephemeral tributary channels, which were temporarily blocked by these structures, as well as by logged tree trunks. The Beas flood is yet another brutal reminder to change our perception towards the developmental approach, given that extreme events are projected to increase in the Himalaya.

Keywords: Alluvial deposits, anthropogenic intervention, Beas river flood, higher Himalaya, Indian Summer Monsoon.

June and 30 July 2023 (source: Department of Revenue, DM cell Govt of HP; https://himachal.nic.in/). This was indeed a major disaster witnessed by Himachal Pradesh in recent times, where the state suffered a loss of Rs 10,000 crores (conservative estimate)[1]. The flood damaged many residential and commercial buildings, washed away stretches of National Highway (NH-3) along with a ~100-year-old bridge near Jiya village (Parvati river, Kullu). The historical Trilokinath temple built in the 16th century in the old Mandi town was also inundated. The flood was a result of the continuous rain of the preceding days caused by interactions between mid-latitude westerlies and the Indian summer monsoons (ISM) as per the Indian Meteorological Department (IMD) update[2] and caused extreme precipitation in June 2013 and August 2010 (refs 3, 4). The high magnitude of the flood raised many questions, such as the impact of climate change in Himalaya, the role of topographic variables, drainage network and/or channel morphology in controlling the flood magnitude at a given location, and the role of anthropogenic factors in flood amplification.

The Himalayan rivers are often frequented by flash floods of varying magnitude during the monsoon. On a local scale, such floods are typically caused by extreme precipitation events which are modulated by a two-step topography[5]. The first break in topography occurs around the frontal part of the Shiwalik Himalaya, also known as the physiographic transition-III (PT-III) whereas the second break in topography is located around the southern slopes of the Higher Himalaya, also known as the PT-II[6]. The moisture-laden winds ascend along the southern slopes of