CORRESPONDENCE

Shiroy lily) in Ukhrul District, where temperate forest (1500–2500 m asl) gradually changes to sub-alpine type of vegetation (2500–2900 m asl). Winter season is severe with night temperature going below zero and snowfall is a regular feature. In this fragile environment, rhododendrons form the dominant or co-dominant species in the forest ecosystem. However, R. arborescens ssp. arborescens, which is common and widely spread of all the rhododendrons is seen sporadically in the higher elevated subtropical pine forest (1200–1800 m asl) of these two districts. Though there are no ethno-botanical uses, rhododendrons are in demand for their beautiful flowers. In ‘Mao’ dialect (Senapati District), they are called ‘Lidinapa/Lidai-pa’ differentiated by suffix ‘kkara’, ‘kongho’ and ‘kava’ for the colour of the flowers being white, red and yellow respectively. In ‘Tangkhal’ dialect (Ukhrul District), they are called ‘Kokluivon’ with the suffix ‘kahunga’ and ‘kachhara’ for red and white flowers respectively. In ‘Meiteilon’ (Manipur), they are called ‘Khorom hei-shak’ with the suffix ‘angangba’ and ‘angouba’ for red and white flowers respectively.

Rhododendrons are constantly exposed to various threats, both anthropogenic and natural calamities. The major threats are shifting cultivation, fuel-wood collection, surface forest fires (mainly accidental), landslides and plucking of flowers and collection of plants by the locals (especially when they venture into the forest for NTFPs collection and hunting), tourists (in case of Dzuko Valley and Shiroy Hills), and pilgrims (in case of Koubru range).

In spite of their ecological importance to the fragile environment and their endemic and red-listed status, no measures have been taken up by the authorities for the conservation of rhododendrons. Some local youth at Shiroy hills have started providing tourist guidelines to prevent disturbance to this fragile environment. However, this practice is restricted during the peak season only (May and June when Shiroy lily is in full bloom). In other states, the scenario is quite different. Two sanctuaries, viz. Shingbha and Varsey Rhododendron Sanctuaries have been already set up in Sikkim mainly for the purpose of their conservation. In Manipur, strategies based on eco-tourism are most welcome as the places where rhododendrons grow are visited by people for various reasons. Enforcement of proper tourist guidelines and conducting awareness programmes for the locals to understand the importance of the rhododendron species in such a fragile environment and the utmost need to protect them will be appreciated.


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Cloud burst-triggered debris flows around Leh

In the early morning hours of 6 August 2010, cloud burst-triggered debris flows led to large-scale destruction around the Leh Valley. It was an unusual event considering the fact that Leh (34°09’N and 77°34’E) is located in the semi-arid Trans-Himalaya, where the mean precipitation seldom exceeds 115 mm. More so no individual month has an average of more than 20 mm rainfall7. The meteorological observatory at Leh recorded 12.8 mm of rainfall between 0530 h of 5 August and 0530 h of 6 August 2010. India Meteorological Department (IMD) suggested that the recent cloud burst was highly localized based on the analysis of satellite imageries (probably after the tragedy) which indicated that an intense convective cloud cluster developed to the east of Leh by 2130 h IST of 5 August 2010 (http://imd.gov.in/doc/cloud-burst-over-leh.pdf). We could see that an unusual dark patch of rather low cloud was building up at the east of Leh town during the evening of 5 August.

Being in the rain-shadow zone, no appreciable vegetation cover exists to protect the sediment from the onslaught of falling rain drops during abnormal rainfall events. The Indus Valley was extensively glaciated in the past6, hence the valley is not sediment-limited. Whenever, there is availability of moisture, hill-slope sediments are mobilized (as debris flows) because such slopes are close to the threshold angle for failure5. Considering that during the abnormal monsoon years, the southwestern monsoon penetrated into the semi-arid Trans-Himalaya3,4, such events tend to mobilize large-scale sediments (debris flow) from the unprotected steep mountain slopes3, implying that an extreme rainfall event and associated debris flows are not new to the Trans-Himalayan ecosystem.

The geomorphology of the Leh Valley is dominated by past glacial and periglacial processes. However, presently the glaciers that were extensive in the past have receded to higher elevations, exposing the wide ‘U’-shaped valley, and debris-laden south-facing slopes around Leh. The retreated glaciers have also given rise to innumerable dried channels that are trending NW to SE around the Leh Valley. At present, little ice patches are present in the distal parts of the relict glaciated valleys, particularly along the Khardungla ridge in the north. These ice patches feed some of the perennial streams that eventually drain into the Indus River.

During the cloud burst rainfall-induced run-off caused failure of debris-laden slopes around Leh. The slope sediments
acquire energy by a combination of granular and fluid flow to maintain motion. As a result large boulders were lifted and transported downslope due to buoyancy. From a process point of view, it was a simple debris flow triggered by torrential rain in Leh. On 6 August our preliminary observation around Leh town indicated that destruction was concentrated in areas located proximal to the mountain slopes and dried channels (Figure 1a). A rapid assessment of the probable cause of high causality around Leh town brings out the following points.

(i) The natural flow path of the channels was obstructed due to the construction of man-made structures that resulted in temporary obstruction and deviation of the flow from its natural courses (Figure 1a and b).

(ii) Maximum destruction was observed along the new Leh road between the petrol pump and the new Leh gate. This road winds alongside the course of a dried channel hollow. It was this channel that wiped out the new bus stand, filled the ground floor of hospital with debris, government school and roads besides destroying many houses.

(iii) Compared to this, the old Leh city (belonging to the 16th century) remained largely unaffected. This part of the town is located on a rather elevated ground protected by a rocky ledge in the north, like an eyebrow, on which the majestic Leh fort is situated.

(iv) In view of the sensitivity of the terrain towards unusual weather events, the habitation sites in the past were judiciously selected, particularly keeping in mind the safety and security of people from natural calamities. This consideration seems to be flawed while developing the new Leh town.

What happened on the early morning of 6 August was definitely an unusual event. There are speculations that under the warm earth scenario, unusual weather events would increase globally. Was it the expression of the rising earth temperature? Due to limited long-term climate data from the rugged Himalayan terrain, it would be hazardous to venture into such speculations at this stage.

However, it is high time to evolve a methodology to ascertain the impact of abnormal/extreme rainfall events on the semi-arid landscape of the Trans-Himalayan region. Such regions are known to have undergone multiple cycles of glaciation. As a result, voluminous glaciogenic sediments are locked in this terrain. The increased frequency and magnitude of unusual rainfall events in future (?) would likely increase the debris flows causing more destruction to the land and the people. The most important study that needs to be undertaken in this region is a detailed geomorphological mapping of the type and nature of distribution of glaciogenic sediments, relict glacier landforms and the build-up areas (towns and villages). This would help in ascertaining the threat perception of the local inhabitants, and the infrastructure which is vital for safeguarding our borders. Since the anthropogenic pressure on the semi-arid Trans-Himalayan region will continue to increase in future, time has come when we should have a better understanding of the unusual weather events and their impact on the earth surface processes.


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