

Brief Report on visit to Alaknanda Valley, Uttarakhand Himalaya during 22-24 June 2013

By

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A major disaster struck on 16/17 June 2013 in Uttarakhand after heavy (64.5mm - 124.4mm) to very heavy rains (124.5mm – 244.4mm) on 16 and 17 June 2013 in several parts of the State (please refer figure 1 below for more information). According to IMD sources, the state had received > 400% rainfall during this period. This abnormally high amount of rain has been attributed to the fusion of westerlies with the monsoonal cloud system.

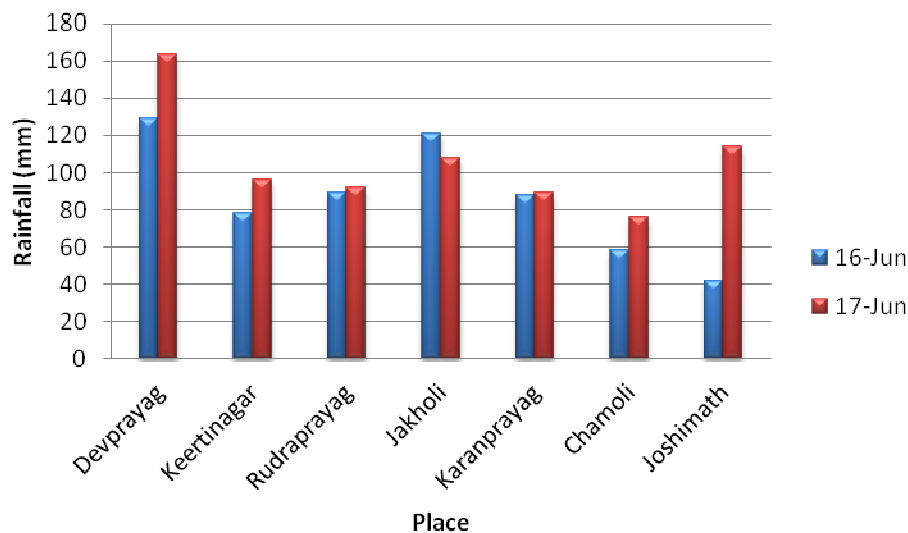


Figure 1: Rainfall Distribution in the visited affected areas (Source of data: IMD)

This heavy precipitation resulted into the swelling of rivers, both in the upstream as well as downstream areas. Besides the rain water, a huge quantity of water was probably released from melting of ice and glaciers due to high temperatures during the month of May and June. The water not only filled up

the lakes and rivers that overflowed but also may have caused breaching of moraine dammed lakes in the upper reaches of the valley, particularly during the late evening on 16 June and on the next day i.e. 17 June 2013, killing about several hundred persons, thousands missing and trapping about a hundred thousand pilgrims. Numerous landslides also took place after these heavy rains and toe erosion of the slopes by the high velocity and volume of water loaded with sediments, stones, rocks and sand. The landslides and toe erosion by the river caused breaching of the roads / highways at many places and washed away several bridges (steel girder bridges, beam bridges, suspension/cable bridges). The Alaknanda and its tributary Mandakini occupied their flood ways and started flowing along the old courses where human habitation had come up with passage of time (when the river had abandoned this course and shifted its path to the east side). Thus, the furious river destroyed the buildings and other infrastructure that came in its way. Geomorphological study of the area indicates that the surface slopes consist mostly of glacial, fluvio-glacial, or fluvial materials which are mostly unconsolidated and loose in nature. The drainage studies indicate a migratory / shifting nature of the river systems that causes aggradations on the concave end of the river and degradation / toe erosion on the convex part of the river. Due to morphological setting of the area, the river has high sinuosity and hence, high level of erosive capacity, especially when it is loaded with sediments (the erosive power of river with sediments is almost square of the erosive power without sediments). The area has been denuded to a great extent due to deforestation and tree cutting for road construction, building construction, mining, hydel projects etc. It has also resulted into increased surface flow and rise of river bed due to disposal of debris into the rivers. Geologically, the rocks in this area are found highly deformed, degraded and dissected by structural discontinuities and drainages.

Seismo-tectonically, the area is traversed by several lineaments, faults and thrusts, which are considered to be geodynamically active. The area had suffered an earthquake on 29 March 1999 (M-6.8) which caused loosening of rock masses, ground cracks and landslides etc., besides killing more than a hundred people due to collapse of buildings. Thus, the natural terrain conditions combined with climatic / weather conditions and haphazard human intervention made a conducive environment for such a hazardous process to take place in this valley.

The hazard turned into a major disaster when people along with their properties and infrastructure occupied such areas without adequate information, knowledge, awareness and preparedness against the potential disaster. As June is a month for pilgrimage by the Hindus and Sikhs, most of the people prefer to visit the temples at Kedarnath, Badrinath and Hemkund Sahib before the monsoon begins. A huge crowd was present in the valley as tourists, pilgrims and trekkers besides the local population, business-men, tour / lodge / guest house operators etc. When the water in the river started growing, these people could not understand what is likely to happen next. By the time, they realized the event, they were already trapped into it and could not find ways to escape. Thus, a large number of people ran to safety on the uphill sides and many of them even tried to quickly cross the swollen fast flowing river that engulfed them as it appeared in furious mood with lot of big stones and sediments. The river Mandakini changed its course to the west side when the moraine dammed lake at Gandhi Sarovar breached. The sediment loaded river began eroding / dumping whatever came in its way. Most of hotels, shops and guest houses / lodges were located on this side and got washed by the river water, killing many of the people who were present there.

Dr. Surya Parkash, Associate Professor from National Institute of Disaster Management (NIDM), New Delhi was deputed by Executive Director NIDM to visit the affected area during 22-24 June 2013 (3 days including the journey time). The main objective of the visit was to observe the major damages along the national highway from Rishikesh to Chamoli and interact with people (including the victims, responders, relief workers, local people) to learn about the event and its impacts. Dr. SP travelled for almost 1000 km over these 3 days and noticed the ground changes and other impacts after the flash floods and landslides at Devprayag, Srinagar, Rudraprayag and Chamoli districts. The visit was restricted to roadsides due to shortage of time to cover distant areas. It was observed during the field visit, a lot of devastation and damages have also happened on the downstream sides in these areas besides a huge toll of lives in the upper reaches. The roads were found blotted with numerous landslides (both fresh and reactivated ones), cracks and subsidence throughout the highway from Rishikesh to Chamoli. Very few vehicles were plying on these roads except for the ones carrying relief materials. A huge amount of sand was found deposited at Srinagar that blocked the highway which was located close to the river. Besides the highway, the damages were found in the University road, SSB camp, school buildings, temples and bridges. Similarly damages to roads, bridges and buildings were also seen on the upstream side upto Chamoli. Numerous photos were taken to record many of these damages and their condition at that time. One of the significant events that took place during the visit was the reactivation of Shiro Bagar landslide between Srinagar and Rudraprayag. Dr. SP passed the highway at this landslide site at 10:30am on 23 June 2013 along with his team to go to Chamoli and on his return at about 4:30pm on the same day from Chamoli to Srinagar, it was found that the highway at the Shiro Bagar Landslide has been completely breached and do

not exist any more. Therefore, an alternate route was chosen to reach Srinagar on the same day. The alternate route from Khankhra goes via Kafoli and Chhatikhal to Srinagar but it is highly damaged and narrow. Some of the photographs taken during the field trip are given below which depict the damages and losses incurred during the catastrophic event in the village areas.

Relief and Rescue Operations were being carried by various agencies including Army, Air Force, ITBP, NDRF, BRO, S&R teams of the State, District Administration, Police, Local community, NGOs etc. in the Kedarghati, Hemkund Sahib, Badrinath and other disaster struck areas. Dr. Surya interacted with the persons engaged in such operation and discussed the issues related to operations and logistic support at the local level to learn about difficulties and problems encountered by the personnel working there. The helicopter operations for relief and rescue were adversely affected by the bad weather conditions in the affected area. The work done by the Army under Operation Surya Hope is laudable and highly appreciable for saving several lives. Besides the rescue with the helicopters, balley bridges, rope bridge, timber bridges and other such quick launch bridges or trolleys etc. were built quickly across the river to help them cross the valley. The surviving victims were provided with food, water, clothes, medicine, shelter and some amount of money through the relief operations. Those persons who were evacuated from the disaster struck areas were sent by helicopter or road conveyances to Dehradun, Haridwar and other down- stream areas. The representatives from various states as well as the family members/relatives/friends of the victims have also arrived at Dehradun to take them back home. The State Emergency Operation Centre at Dehradun issued regular bulletin about the persons rescued, trapped, missing, killed etc. through website, emails and SMS

services. The control rooms were operational in the district headquarters where Additional District Magistrate along with District Project Officer (Disaster Management) and Sub Divisional Magistrate were monitoring and supervising all the relief and rescue works at the district level. Chief Minister of the State, Minister for Disaster Management, Chief Secretary, Principal Secretary (Disaster Management) and Executive Director, Disaster Mitigation and Management Centre were among the main functionaries involved in these operations at the state level. Besides the State Government and Central Government Agencies involved in disaster response, number of VIPs like Union Home Minister Shri Sushil Kumar Shinde, Hon'ble Member of NDMA Shri V.K. Duggal, Gujarat Chief Minister Shri Narendra K. Modi, Shri Rahul Gandhi and others have also visited the disaster struck area to overview the crisis situation. On behalf of the Central Government, Shri V.K. Duggal, Hon'ble Member NDMA was appointed as Nodal Official to coordinate the search and rescue operations being carried out by various agencies. The important issues related to political, administrative, technical, social and environmental perspectives will be discussed later in the documentation report after the detailed studies of the event.

Photographs depicting damages to highway & hydel project along Rishikesh-Chamoli highway (Photo Courtesy: Dr. Surya Parkash, NIDM)



Photographs revealing damages to bridges along Rishikesh-Chamoli highway
(Photo Courtesy: Dr. Surya Parkash, NIDM)



Photographs depicting occurrence of landslides and subsidence along Rishikesh-Chamoli highway (Photo Courtesy: Dr. Surya Parkash, NIDM)



Photographs depicting post-disaster relief and rescue operations (Photo Courtesy: Dr. Surya Parkash, NIDM)



Based on the field observation, it is proposed that the area may be revisited for detailed studies, understanding of the event, damage / loss and needs assessment, documentation and recommendations for rehabilitation, recovery and redevelopment. The following activities may be undertaken by the Institute:

- Collection of terrestrial, meteorological and anthropogenic data with particular focus on landslides, rainfall and other information relevant to the event
- Collection of damage/loss and needs assessment data for the affected population and resources including various structures, infrastructure, utilities and services
- Organize a national level meeting / workshop focusing on “Natural Disasters in Uttarakhand State – Incidents, Issues and Options for Risk Reduction” to gather views and experiences of all stakeholders including victims, responders, local people, experts, field officials, professionals, and academicians etc.
- Field visit of a multi-disciplinary and cross sectoral team to the affected areas for detailed investigation / studies from different perspectives to put forth practical ideas for reducing such incidents and their impacts as well as helping the affected population in rehabilitation and recovery
- Prepare a document to highlight the lessons learnt from the catastrophic event and to explain what went right and what went wrong in pre, during and post disaster situations in the affected area

- Development of necessary guidelines and action plans for tourist / pilgrimage places, hotels/lodges/guest houses etc., keeping in mind the concentration of people at such locations during the time of disasters
- Prepare a disaster risk assessment and reduction plan including immediate, short, medium and long term actions, that may be undertaken for integrating DRR with development in future
- The area may be studied from technical as well as socio-environmental point of view to propose suitable developmental activities and discourage improper constructions.
- Innovative ideas for amalgamation of state of art technology with the indigenous traditional knowledge and skills for effective community practice