सत्यमेव जयते

HEALTH ADAPTATION AND RESILIENCE TO CLIMATE CHANGE AND RELATED DISASTERS

A Compendium of Case Studies

2021

A Compendium of Case Studies under the project HER-CAP supported by WHO India

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Resilient India - Disaster free India

National Institute of Disaster Management (NIDM)
(Ministry of Home Affairs, Government of India)

Chapter 5

FLOODS IN HILLY AREAS REQUIRE A DIFFERENT APPROACH

(Case Study - Uttarakhand Cloud Burst of June 2013)

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ABSTRACT

The multi-day cloudburst over the Himalayan state of Uttarakhand caused havoc and huge loss of life, property and infrastructure loss within a short span of a few days. The rainfall between 16th and 20th of June 2013 was 375% above normal for the period. Four hilly districts of Uttarkashi, Rudraprayag, Chamoli and Pithoragarh were completely cut-off for days together. Weather conditions like heavy rainfall, very cold temperatures and fog further hindered the rescue and relief activities that were essential in the initial days of such disasters. Post-traumatic stress disorders, rrespiratory infections, diarrhoea, skin infections, fever, vomiting were common among flood victims. New innovative flood management guidelines to manage floods in hilly areas should be prepared.

Keywords: *Cloudburst, Floods in hilly areas, Post flood situation, Challenges.*

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1. INTRODUCTION

Uttarakhand state has a composition of metamorphic rocks and tectonically active making the state vulnerable to repeated disasters and climatic risk. Socio-economic, geopolitical, environmental and ecological make up of the state makes it highly vulnerable to natural disasters, cloudburst being one among them. The average annual rainfall in Uttarakhand is about 1229 mm with the state having cold weather with snow for many months, besides receiving moderately high rainfall and mild summers given the terrain.

In terms of vulnerability profile, the state is prone to landslides, earthquakes, floods, hailstorms, lightening, road accidents and also epidemics. The state remains in the Zone IV and V for earthquake and other multi-hazard risk like avalanche, cloud bursts and forest fires. (SDMP-UK).

Historically, the earthquakes of 1991 at Uttarkashi and the 1999 earthquake at Chamoli have been of lesser magnitude, but seismic events of greater magnitude can be anticipated in the days to come, driving the agenda to prepare a composite risk index to climate change driven risks. The landslides of 1998 at Malpa killed over 300 people while the one that occurred in 2009 at La Jhakela in Munisyari Tehsil claimed 43 lives, besides large number of loss of livelihood. Similarly cloud bursts have had historical relation with the state where 43 people lost their lives in the 2009 cloudburst at Pithoragarh and the 2010 cloudburst at Kapkot saw 18 children buried alive with 36 lives lost.

As per the Vulnerability Atlas of India, in Uttarakhand approximate 56% percent houses are made of mud, un-burnt brick and stone wall. This is a sign of 27 very high vulnerability, considering probability of Earth quake, Landslides, Flash flood and Cloud burst etc. (SDMP-UK)

The multi-day cloudburst over the Himalayan state of Uttarakhand caused havoc and huge loss of life, property and infrastructure loss (Houses, Hospitals, Hotels, temples, townships) within a short span of a few days. Uttarakhand is a well-known tourist place and religious place. The birth place of rivers became watery graveyard in few hours of cloudburst and the state witnessed one of its worst monsoons in June 2013.

The rainfall between 16th and 20th of June 2013 was 375% above normal for the period. (Aggarwal, 2018). Official figures documented a loss of around 6,000 lives Over 2000 houses were destroyed, 147 bridges were destroyed and 1,307 km of roads were damaged. Buildings which were constructed along the path of the rivers without following any construction norms were washed away along with several vehicles that were parked. Large number of dams on the Himalayan rivers and large hydropower projects aggravated the situation.

Four hilly districts of Uttarkashi, Rudraprayag, Chamoli and Pithoragarh were completely cut-off for days together. The complex phenomenon of high intensity rainfall (cloudbursts) leading to massive landslides, debris flows and flash floods became etched in public consciousness during this disaster. This phenomenon was not clearly predicted by any agency national or international. Along with the unprecedented nature of the calamity, the unpreparedness of the national, state and local authorities made it difficult to manage the mitigation, rescue, and relief efforts that followed.

The Himalayan mountainous terrain with its unstable soil led to multiple landslides and debris flows thus destroying the road network which cut off the access to evacuation of victims and supply of relief materials. Weather conditions like heavy rainfall, very cold temperatures and fog further hindered the rescue and relief activities that were essential in the initial days of such disasters. Dropping of relief material by air (helicopters) which is normally done in plains (such as Bihar) was not possible due to the presence of trees and isolated homesteads.

2. RAINFALL RECEIVED DURING THE PERIOD OF JUNE 2013

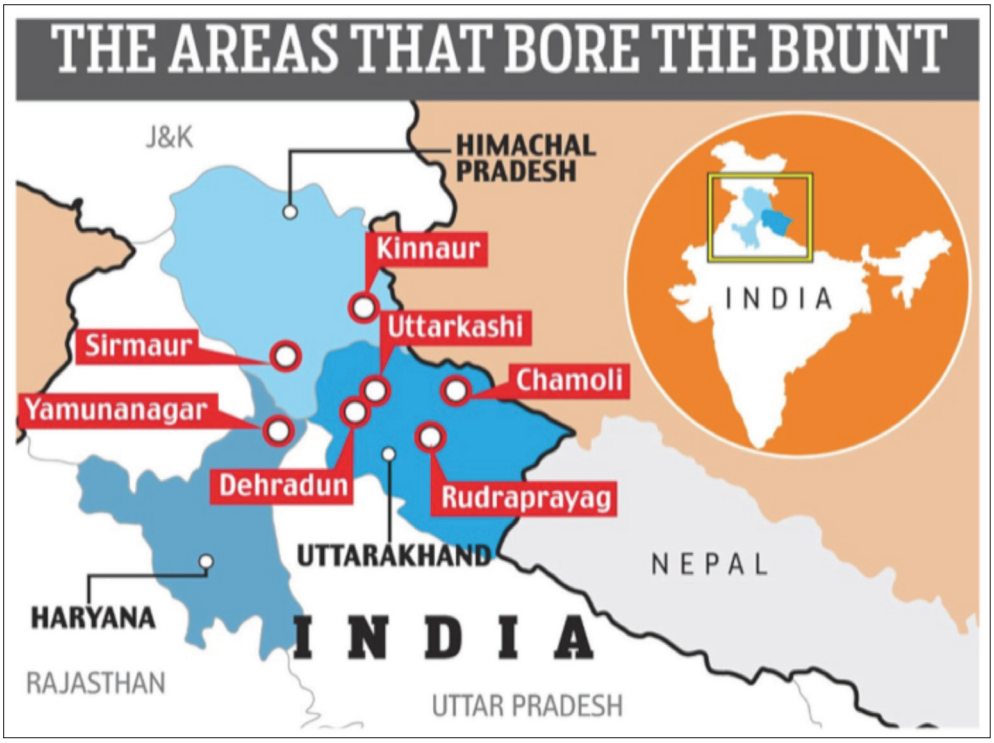
On 17th June 2013 the state of Uttarakhand in India (Latitude 28.72°N to 31.45°N and Longitude 77.57°E–81.03°E) received more than 340 mm of rainfall, which is 375% more than the daily normal (65.9 mm) rainfall during monsoon.

Rainfall Data of the districts

Districts	Average in the month of August Rain Fall of the district in mm	Max Monthly Rainfall in last 100 years in mm	Min Monthly Rainfall in last 100 years in mm	Rainfall on August 2013 in mm
Dehradun	673.9	1271 August 1943	20.4 June 1965	676.7
Uttarkashi	405.2	800.8 (August (1963)	36.88 (June 1987)	529.9
Teheri Gorwal	366.7	1097 (Sept 1995)	0 (Sept 1977)	453.4
Haridwar	367	848.2 (Sept 1924)	0 (Sept 1971)	426
RudraPrayag	639.4	914.6 (Aug 1925)	0 (Sept 1971)	664
Pithoragarh	538.9	1057(Aug 2000)	22 (June 1901)	471.9
Chamoli	452.4	860.7 (Sept 1924)	0 (1998)	537.9

On 17th June alone, the state of Uttarakhand received more than 340 mm of rainfall (37 cm/day in Dehradun [30.32°N, 78.36°E]; as reported in the Climate Diagnostics Bulletin of India, June 2013 (Dube A 2014), which is 375% more than the daily normal (65.9 mm). The India Meteorological Department (IMD) reported a weekly departure of about 847% in the rainfall volume for the week ending on 19th June 2013 in Uttarakhand.

MAP OF AFFECTED AREA 2013:



3. OBSERVATIONS, LESSON LEARNT AND CHALLENGES: GROUND REALITIES

3.1 Post flood situation:

3.1.1 Missing Tourist and Pilgrims

More than 70,000 pilgrims and tourists trapped in the valleys nearly 3 days. About 110,000 people were evacuated by Indian Air Force, Indian Army, Indo-Tibetan Border Police (ITBP), Border Security Force, National Disaster Response Force (NDRF) which was recorded as the most challenging and the largest evacuation in hilly areas.

Pilgrims and tourists were the main victims of the cloudburst. Most of the pilgrims were elderly population. People searching for their family members, relatives and friends was the most common scene in the disaster site. Few survivors were searching their close relatives by showing the photographs of missing people and asking for their whereabouts.

3.1.2 Rescue and relief

58 Helicopters 7,000 soldiers, airlifted a total of 18,424 people, 150 parachute commandos were deputed for the rescue. During the rescue two Helicopters were crashed on 25 June and killed 20 people due to bad weather conditions.

Relief materials supply and distribution were completely hampered due to lack of connectivity both by road and air.During relief work, 3,36,930 kg of relief material were dropped for the survivors. As most of the roads were damaged relief materials could not reach the disaster site. Even distribution of relief materials through helicopters was a big challenge because of the extreme weather conditions and scattered houses in the hilly and forest areas.

3.1.3 Health issues: Even after a week, dead bodies had not been removed from Kedarnath town. Identification and preservation of dead bodies, collection of DNA samples and disposal of dead bodies was the major challenge for the health team.

3.1.4 Emergency medical relief: Immediate requirements were resuscitation, dressing materials, splints, portable X-Ray machine, mobile operation theatre, lifesaving drugs, medical evacuation and trained manpower. Emergency medical relief was provided by Quick Reaction Medical teams, Mobile field teams, Floating hospitals, Army relief mobile vans, Heli-ambulance and Railway Medical vans during mass causalities.

Since, the disaster coincided with peak time for tourists and pilgrims, the casualties and damage. Majority of them had minor and major injuries including fractures. Respiratory infections, diarrhoea, skin infections, fever, vomiting, eye infections, Leptospirosis, Snake bites were common among flood victims.

Post-traumatic stress disorders were the major concern along with large number of deaths among the males. Local survivors were in shock for few days as they lost their near and dear ones. Social worker, Psychologist, Psychiatrist played a crucial role in handling such issues.

4. TRANSPORT

Most of the vehicles carrying relief materials were stranded due to heavy landslides which made it difficult for the timely distribution of relief materials.

5. FOOD AND WATER

Most of the food grains were washed away along the river banks. Hence, there was a shortage of food material. Availability of safe drinking water was the main issue as the most of the surface water was contaminated by the flood water.

6. AGRICULTURAL LOSS

Most of the farmer's lands were washed away due to heavy floods. Whatever they cultivated were lost due to cloudburst. Over 10336 hectares of land has been washed away by rain including crops of rice, wheat, lintels pulse, potatoes and vegetables have been drowned by the floods and derbies of landslides and paddy field, and >500 hectares of top soil has been turned into silt in the flood affected areas.

7. COMMUNICATION

Communication was the biggest barrier for emergency rescue, evacuation and emergency medical relief due to poor or absolutely no connectivity either landline or mobile network.

8. LOSS OF LIVE STOCK

People lost their livestock mainly, Animals like cows, buffaloes, sheep, goats.

9. DAMAGES

Life lines namely roads, bridges, Hospitals, electric poles, telephone poles and property damage was observed along the river banks. Damaged houses were filled with mud and sand up to 4-5 feet level destroying all the household belongings.

10. SPECIAL CHALLENGES

Uttarakhand state receives a large number of tourists throughout the year. During the disaster, a large number of pilgrims and tourists (nearly 3 lakh), many elderly, were stranded in vehicles for 2-3 days with little food. The presence of tourists during such disasters creates special challenges for evacuation.

Even though rescue and relief operations can only be conducted by air in such hilly areas, the presence of thick fog, heavy rainfall, poor visibility, cold weather, forested areas, melting of snow, narrow valleys, inaccessible areas, and lack of designated landing and drop-off sites for helicopters proved to be a challenge.

11. RECOMMENDATIONS

Periodic Flood forecasting and warning system is very essential during the pre-disaster period to prevent damages and save lives

Flood zoning regulations needs to be followed strictly during construction of buildings near the riverbanks

Flood proofing measures namely flood shelters; flood safe buildings are very much required in the flood prone areas.

New innovative flood management guidelines to manage floods in hilly areas should be prepared. Capacity building of human resources should be done at all levels in relation to preparedness, and post-floods stage: Rescue, Relief, Recovery, Reconstruction, Rehabilitation and Research.

Loss of agricultural land and damaged buildings along the river bank

Damaged roads Heavy traffic jam due to landslides and they are staying in vehicles for days with fear

House filled with mud and sand after the calamity

Picture Credit: Dr. Ramachandra Kamath (Author)

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